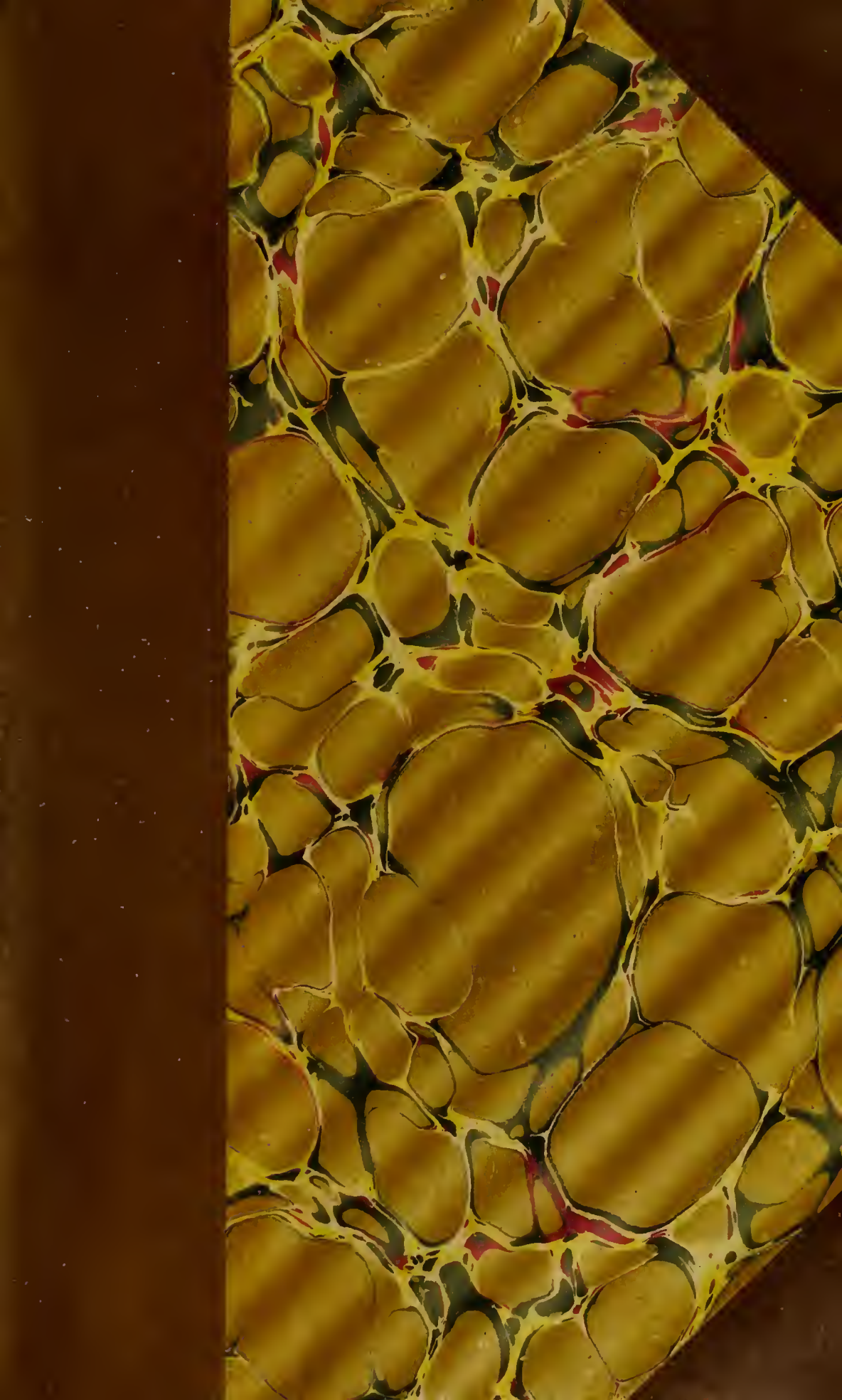




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S U R G E R Y :

B Y

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T H E O R Y A N D P R A C T I C E

O F

S U R G E R Y.

C H A P T E R X X V I.

*Of the Varicocele, Circoccele, Spermatoccele,
and Pneumatoccele.*

BY the term Varicocele is meant, a varicose distention of the veins of the scrotum, which in this state form a tumor of hard knotty inequalities, seldom attended with pain, and, in general,

VOL. VI. A ral,

ral, productive of no inconvenience except what arises from its bulk.

The Circocoele is a tumor of a similar nature, only it is seated in the course of the spermatic cord, and extends from the superior part of the scrotum to the abdominal muscles, and is produced by a varicose distention of the spermatic vein.

These tumors are occasionally produced by pressure on the course of the veins: but for the most part, no cause of this kind can be discovered; in which case, we conclude that they arise from debility or relaxation in the vessels in which they occur.

When tumors in the course of the veins are perceived to give rise to these swellings, or when the pressure of a hernial truss upon the spermatic cord appears to have produced them, the removal of this evident cause of the disease, should be the first attempt towards a cure.

When produced by the pressure of a truss, an alteration in the bandage will
sometimes

sometimes remove them. When tumors of a schirrous nature give rise to them, these must be extirpated when it can be done with safety; and, on the contrary, when the tumors by which they are produced have any tendency to suppurate, warm emollient applications will be the most useful remedy.

But when a general relaxed state of the veins appears to be the cause of their distention, such remedies should be employed as will most effectually recover that tone of which they have been deprived by the long continuance of the disease. For this purpose, nothing commonly answers so well as the use of a proper suspensory bandage, and the application of a solution of alum, a solution of crude sal ammoniac in vinegar, and other astringents, to the parts affected.

By due attention to this kind of management, the increase of almost every tumor depending upon this cause, may be prevented; and so much relief will be thereby obtained, as to render the harsh

remedies of the knife, the cautery, and ligature, recommended by ancient writers for the removal of these tumors, altogether unnecessary.

By the *Spermatocele*, is meant, a morbid distention of the epididymis and vas deferens, produced, as is supposed, by a stagnation of semen. This may arise from tumors, stricture, or inflammation about the *caput gallinaginis*, or in the course of the vas deferens; but there is reason to think, that it is most frequently induced by inflammation.

When produced by inflammation, general and topical blood-letting, gentle laxatives, a low cooling diet, and rest of body, will commonly prove the most useful remedies, and of these none are more to be trusted than topical blood-letting with leeches, which should be repeated from time to time, according to the urgency of symptoms. And again, when tumors are discovered to press upon the vas deferens, they should either be brought to suppurate, or removed with the scalpel.

when

when it can be done with safety. At other times, these tumors are connected with lues venerea; in which case, a well directed course of mercury will be most likely to answer.

By some we are told, that all the other means having failed, castration has at last been found requisite.

This, however, I can scarcely, in any case, suppose to be necessary; at least I never met with an instance of its being so.

The term Pneumatocele, is applied to signify a distention of the scrotum by a collection of air.

This has been described by most of the ancient writers as a frequent occurrence; but there is much reason to think, that a great proportion of all the tumors which they describe as containing air, were either formed by collections of water, or by the protrusion of some of the bowels. That species of hernia to which young children are liable, is to this day, by our common people, termed a wind rupture,

as is the case with all those collections of water in the scrotum, with which newborn infants are affected. But we know well, that none of these tumors are formed by air; and that their contents are of a very different nature.

In wounds of the lungs, air is sometimes thrown into the surrounding cellular substance, and in that way passes into the scrotum, as it does in particular instances over the whole body; and in high degrees of putrid diseases, so much air may be separated from the blood, as to distend the cellular substance of the scrotum, as well as of other parts. But a real pneumatocele has never probably existed as a mere local affection of the scrotum; at least I have never seen it.

In the case of air spreading to the cellular substance of these parts, as a consequence of a wound of the lungs, the same remedy proves effectual that we employ for anasarcaous swellings formed by water, to wit, small punctures with the point

of a lancet, which are found to be sufficient for discharging great quantities of air. But whenever the disease is induced by such a great degree of putrescency in the system, as will produce a separation of air from the blood, there can be little reason to expect any advantage to result from whatever means may be employed.

CHAPTER XXVII.

Of the Sarcocoele, or Schirrous Testicle.

THE term Sarcocoele, implies a firm fleshy enlargement of the testicle: A simple inflammatory swelling of the testis affords a tumor of some degree of firmness; but the true sarcocoele, or schirrous testicle, is attended with a hardness altogether unusual in the real hernia humoralis, or inflamed testicle.

A schirrous testicle, in the course of its progress, puts on such a variety of appearances, as renders it difficult, by description, to give an adequate idea of it. In
general,

general, however, the accession and progress of the disease is this :

An unusual degree of hardness, attended with some enlargement of the testis, is the first indication of the disease. The parts are not at first discoloured, nor is there any material pain. In a gradual manner, the tumor acquires a larger size. At first, it is smooth and equal, but, when it becomes larger, it also becomes harder and knotty or unequal on the surface: Slight pains are felt through the substance of the tumor; and if it be not suspended, the patient complains of uneasiness in his back.

When the constitution is sound, the disease will occasionally remain in this situation for a great length of time; and, in some instances, by moderate diet, keeping an open belly, suspending the tumor properly, and avoiding violent exercise, the tumor has not only been prevented from increasing, but, in a gradual manner, has been dissolved. This favourable termination,

mination, however, it must be owned, is exceedingly rare ; for the tumor, instead of remaining stationary, in general becomes worse. It acquires a larger size ; becomes ragged, and more unequal on its surface ; and the pain, which at first was trifling, becomes more severe, darting, in smart stings, through the substance of the tumor.

The inequalities on the surface of the tumor by degrees increase, and at the same time they acquire the same kind of hardness with the swelling from which they arise. In some instances, a considerable quantity of serum is extravasated into the tunica vaginalis, which, to those not acquainted with the nature of the disease, gives the tumor the appearance of a common hydrocele ; and, at other times, instead of such depositions into the vaginal coat of the testicle, partial collections of matter take place through the whole body of the tumor. These by degrees increase, and the scrotum, which has hitherto been gradually distending, at last bursts, and a discharge

discharge takes place from the various collections in the body of the tumor, of a thin, fetid, bloody matter.

In some instances, the spermatic cord becomes hard and enlarged soon after the commencement of the disease; but, in general, the cord is not affected till the tumor has acquired a considerable size, and most frequently, I have observed, not till matter has formed in it.

As the tumor of the testicle advances, this affection of the cord also becomes worse. From being at first only slightly tumefied, it gradually turns more hard and swelled; it becomes so painful, that it can scarcely bear to be touched, and knotty or unequal through the whole extent of it.

The discharge from the openings in the scrotum still continues: But, although the quantity of matter is increased, the size of the tumor is not thereby diminished. On the contrary, it still continues to increase, the edges of the sore become hard, livid and retorted, and fungous excrescences

crefcences push out from different parts of it.

Whatever was the ftate of the patient's health on the firft attack of the difeafe, in this advanced ftate of it, it is always much impaired. He now becomes emaciated, of a pale, wan complexion, and the difeafe, which, in this ftage, is a real cancer of the moft malignant nature, turning ftill more virulent, by the pain becoming more tormenting, the patient is at laft carried off in much mifery.

Such, in general, is the progrefs and event of this dreadful difeafe, if not interrupted by the extirpation of the teftis, before it has gone too far. I have already obferved, that it exhibits a great variety of fymptoms. Thofe I have enumerated occur moft frequently; but no description can convey a clear idea of all the appearances that it affumes.

In fome, as I have obferved above, it remains apparently in an indolent inactive ftate, for a great length of time, even for years; and, in others, it proceeds fo
rapidly,

rapidly, that, in the space of a few months, I have known it pass through all the changes I have enumerated.

Nor is any age, temperament, or line of life, exempted from it: It happens equally to the opulent and to the most indigent; and I have met with it in all ages, from the sixteenth to the seventieth and eightieth year, but not so frequently in early youth, as in more advanced stages of life.

In a great proportion of cases, the disease begins in the body of the testis, affecting the whole of it equally; but, in some, it makes its first appearance in the epididymis, and occasionally even in the spermatic cord. It has been a prevailing opinion, indeed, that a scirrhus hardness, tending to cancer, never begins in the epididymis, and that the testicle is always first affected.

This is certainly in general the case, but every practitioner must, at times, have met with instances of cancer beginning in the epididymis, and sometimes
even

even in the spermatic cord, and spreading from thence to the neighbouring parts. I might here insert different cases which have fallen within my own observation; but Mr Pott's collection furnishes a sufficient number of well-marked examples*.

In almost every case of swelled testicle from gonorrhœa, the epididymis is not only affected before the testicle, by the inflammation spreading from the urethra, along the vas deferens; but the swelling, when it begins to yield, always first removes from the testicle, leaving, in general, a hardened state of the epididymis, which, for the most part, continues in some degree during life. But, as the hardness produced in this manner is entirely the effect of inflammation upon a membranous or vascular part, so here, as in other parts of the body of a similar texture, we seldom find that hardness induced by inflammation terminates in cancer.

The

* Treatise on the Hydrocele, cases 42. 48. and 49.

The contrary, however, of this has been too much inculcated; and it has been even said, that the hernia humoralis, produced by lues venerea, is a frequent cause of the worst kind of scirrhus testicle, which, as the fact is otherwise, has this improper effect, that it prevents the use of, and a proper perseverance in such courses of medicine, as might, in many instances, remove the disease. Nay, the idea has been carried so far, that, in different instances, the testis has been extirpated, when there was much reason to think that the swelling might have been removed by mercury. This, there is reason to suppose, would happen when the scirrhus remaining after the operation assumes all the appearances of a venereal ulcer, and is afterwards cured by mercury, as has happened in more instances than one in the course of my observation.

But, although I have said that tumors of the testis, from a venereal cause, seldom terminate in this manner, yet I will not go so far, as to say that they never do
so;

so; for I know, that a hardened state of the testis and epididymis produced originally from a venereal taint, does, in some instances, degenerate into the worst species of sarcocoele. That is, that although tumors in this part, arising from lues venerea, are most frequently cured by mercury, yet occasionally, and in particular constitutions, the peculiarities of which, however, we are not acquainted with, they do certainly end in schirrus of the worst kind, a disease which might never probably have appeared, if the original venereal taint had not acted as an exciting cause of it. We know that a predisposition to diseases will remain long in a latent state in the system, without any evident affection being excited, till the application of some particular stimulus brings it into action. In the same manner, a venereal affection of the testis, or even that hardness of the epididymis that remains after an inflammatory tumor of these parts from gonorrhœa, will, in some constitutions, terminate ill, although,

in a great proportion of cases, it is otherwise, and no disagreeable effect proceeds from them.

I have dwelt longer upon this than I otherwise should have done, from a contrary doctrine having been strenuously inculcated by one whose authority is deservedly great, and whose observation in this disease has led to the conclusion he endeavours to establish *. But, as the result of my observation has been exactly what I have stated it to be, I could not avoid speaking of it in the manner I have done.

In the treatise to which I allude, we are told, that a hernia humoralis is never, in any instance, productive of this disease. If, on this subject, Mr Pott's idea is just, it ought undoubtedly to be received; but, if it is not, it may certainly do mischief, by rendering both patients and practitioners more remiss in cases of sarcocoele proceeding from this cause, than

VOL. VI. B they

* Mr Pott, Treatise on the Hydrocele, &c. p. 232.

they otherwise would be; as, by continuing still in hopes of a mercurial course being able to accomplish a cure, they may thereby allow the disease to go too far, even for extirpation to be advisable.

In every doubtful case, when a venereal infection is suspected to be the cause of the tumor, blood-letting, when the pulse is full, an open belly, a cooling diet, a horizontal posture, a proper suspensory bandage, and a well directed course of mercury, will commonly remove it. But, when these means are employed without advantage; and especially, if, during their application, the tumor, instead of decreasing, becomes gradually worse, as soon as, from its increase, there appears to be any risk of its advancing beyond the reach of operation, it ought then, without farther hesitation, to be extirpated, whatever the cause may be by which it was at first produced.

Among other causes mentioned by authors as producing a schirrous state of the
testis,

testis, is the hydrocele of the tunica vaginalis. From quantities of a serous fluid being frequently found in the vaginal coat of a schirrous testicle, it has been supposed, that the water, in such cases, was the original cause, and not the effect of the disease in the testis. There is much reason, however, to think, in these collections of water in the tunica vaginalis, in which the testis is found diseased, that the hardened state of that organ ought to be considered as the original disease, and not the water which surrounds it.

Collections of water are, no doubt, often met with, even in the real sarcocoele; but this we are to consider entirely as a different stage of the same disease: For, although the true sarcocoele is not at first attended with any collection, either of blood or serum, it is natural to suppose, that an enlarged or hard state of the testis must have some influence, both on the quantity and appearance of the fluid with which the tunica vaginalis is always provided.

If it either produces an augmented secretion, or a diminished absorption of this fluid, a dropfical swelling must take place; and every such collection, combined with a schirrous testicle, has been very properly termed a hydro-sarcocoele.

That the testis, by remaining long immersed in the serum, even of a true hydrocele, is frequently altered in its texture, there is no reason to doubt. Thus, on laying open the tunica vaginalis, in a common hydrocele, the testis is very commonly of a more pale appearance than in a state of health.

In some cases, it is much diminished, and, in others, considerably enlarged; but all such enlargements, when connected with a real hydrocele, are of a soft, harmless nature, and never give pain. In this state, the testis should never be extirpated.

This is a point I may remark, which it is of much importance to ascertain: For, on the idea of this enlargement of the testis, frequently connected with, and per-

haps

haps produced by immersion in the water of a hydrocele, being of a real scirrhous nature, the operation of extirpation has been often advised, and unfortunately too often practised. In circumstances of doubt, the means of distinction between the mild and malignant variety of enlarged testicle, by which we should in general be directed, are these: When either the body of the testis or epididymis, or both, are hard and enlarged previous to any collection of serum in the tunica vaginalis, such collections as afterwards take place ought not to be considered as constituting a simple hydrocele. If the tumor has been accompanied with pain, and if, upon discharging the serum by incision, the testis, besides being enlarged, is found in a state of hardness, or is ulcerated on the surface, extirpation should be immediately advised. While, on the contrary, when the water of a hydrocele is known to have been collected while the testicle remained sound, and of its natural size, whatever enlargement it

may be found to have acquired on laying the sac open, if the testis is neither of a scirrous hardness, nor affected with pain or ulceration, we ought unquestionably to proceed as in a case of simple hydrocele; for, this kind of enlargement will be rarely found to excite future uneasiness, and will consequently seldom or never render extirpation necessary.

In judging of the probable termination of a scirrous testicle, different circumstances require attention: The age and habit of body of the patient, the duration of the disease, and the state it is in at the time.

Thus, whatever treatment is to be adopted, more success may be reasonably expected in a young healthy constitution, than in the reverse; particularly if extirpation of the testis is to be advised. In the former, the chance of success from the operation is commonly considerable, provided the disease is not too far advanced; whereas, in old or infirm people, and in habits attended with pale, wan
complexions,

complexions, with indigestion, and other symptoms of obstructed viscera, whatever state the disease may be in, little or no advantage can be expected to accrue from any operation.

The complexion, of itself, I must observe, does not, in this disease, merit much attention; for, I have scarcely met with an instance of the true sarcocoele, even in the early and most simple stage of the disease, in which a pale complexion did not take place. It seems to be, in a great measure, the effect of that anxiety and dread for the final event of the disease, to which patients, with tumors of this description, are particularly liable; but it is materially different from that wan, sickly countenance, often accompanied with a slight tinge of bile, that we meet with in the advanced state of the disease, when attended with obstructions of any of the abdominal viscera.

With respect to the duration of the disease, if it has already subsisted for a considerable time without making progress,

there will be reason to think that it is of a mild nature, and that the system is not so much affected as if its progress had been great and rapid; and, lastly, the state of the tumor at the time is of much importance in forming a prognosis of the event. As long as the testicle is only somewhat hard and enlarged, without the formation of matter, and without any disease of the cord, if the constitution is otherwise healthy, there will be much cause to hope for a favourable event from any operation that is advised.

But, on the contrary, when the disease is so far advanced, that collections of matter have formed, either upon the surface of the testicle, or in its more internal parts, as in this state there will be cause to suspect that the constitution has suffered from absorption, so there will be less cause to hope that the operation will prove successful, than in the more early stages of the disease. And this is more remarkably the case, when ulcerations have taken place on the surface of the tumor;

mor; for, we know well that absorption is much more apt to take place from tumors in a state of ulceration, than from matter to which the air does not get access.

In whatever state, however, the tumor may be, there is always reason to hope for more success from the operation, while the spermatic cord is yet sound, than when it has become diseased; for, as soon as the cord is much affected, the chance of success from any means to be attempted, will always be proportionally less. The cord, indeed, may, towards its under extremity, be diseased, even in the same manner with the testis itself, without lessening the chance of benefit from the operation; but, whenever the disease has spread so far up the cord, as to render it doubtful whether the parts affected can be all removed by the knife or not; and especially, if there is reason to think that the cord is diseased within the boundaries of the abdomen, instead of there being, in such circumstances, any advantage to
be

be expected from the operation, every attempt towards the removal of the parts below, will, for certain, tend to aggravate the symptoms, and hasten the death of the patient.

When a schirrous or cancerous tumor is so situated, that it can be entirely removed, the operation ought immediately to be advised; but, when the disease has advanced so far as to render this impossible, in whatever part of the body it may be seated, no attempt of this kind should be made, the fact being now clearly ascertained, that cancerous affections are always rendered worse by extirpation, when all the diseased parts cannot be removed.

It is of much importance, however, to observe, that the spermatic cord is frequently affected with a fulness and thickness of its parts, produced by the weight of the tumor alone, without being in any other respect diseased. A fulness of this kind, when the cord itself is not painful, and when there are no knots or inequalities

ties upon its surface, ought not to prevent the operation, when, in other respects, it appears necessary; for, a mere enlargement of the cord very frequently occurs, either from a varicose state of the vessels, or from a watery deposition in the cellular substance of the part, when it is not in any other manner diseased*. But, on the contrary, when the cord, at the same time that it has become enlarged, hard, and knotty, adheres to the neighbouring parts, is painful to the touch, or ulcerated, these, if the disease extends over the whole process, up to the abdominal muscles, are circumstances which, with every prudent practitioner, will, at all times, forbid the operation of castration.

It has, indeed, been proposed, in this state of the cord, to enlarge the opening in the external oblique muscle, so as, by dissection, to trace the diseased parts even
into

* Of the point here inculcated, some singular proofs are recorded by Mr Pott, in his useful collection of cases. See *Treatise on the Hydrocele*, Cases XXXIX. XL. XLIX. and L.

into the cavity of the abdomen, with a view to remove them entirely. But, although theoretical writers may attempt to amuse their readers with such proposals, they will never be seriously thought of by practitioners, whose opportunities for observation enable them to think and act for themselves.

It is unnecessary to enumerate either internal medicines or external applications, as none have been employed with advantage, for the removal of this disease. *Cicuta* and *belladonna*, so much celebrated in cancerous affections, have no effect in arresting its progress, or in mitigating its symptoms. It is on the extirpation of the diseased parts that we alone rely for a cure: Hence, it is a point of the first importance, to ascertain the period of the disease at which the operation is most advisable.

I have already observed, that occasionally we meet with a scirrhus enlargement of the testis, with which patients walk about for a great length of time,
with

with little or no inconvenience. Such instances, however, are exceedingly rare; for, by much the greatest proportion, prove to be of a malignant nature, and proceed rapidly to a state of pain and hazard. I may therefore observe, that, whenever a schirrous or hardened state of the testicle does not yield to the means commonly employed, such as moderate evacuations of blood, when these are indicated, a cooling diet, a lax belly, the use of a suspensory bandage, and especially when mercury, which, on the chance of the disease being venereal, is very commonly tried, are all used without advantage, we may, in such circumstances, always have much cause to suspect that the disease is of a bad nature. When more inveterate symptoms appear, when the tumor, which, till now, was in a hard indolent state, becomes painful, and increases in bulk, no further delay should be advised. For, however improper it would be to remove a hardened testis, which for a considerable time had remained

remained

mained indolent, without pain or increase, it would be equally unpardonable in any practitioner to advise the operation to be delayed, when matters are so far changed, that the tumor is become painful, and daily becoming larger. In such circumstances, the sooner the diseased parts are removed, the greater will be the chance of a recovery; and not a day, therefore, should be lost: For, whatever may be the opinion of the late Mr Sharpe on this point, and some others who appear to have copied from him, it has long been a fixed maxim with the most experienced surgeons, that, in all schirrous or cancerous affections, the risk of a relapse after the operation, is commonly in proportion to the duration of the original disease *.

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* The opinion of the late Mr Sharpe on this point, was singular in a man of such extensive experience. He considered the risk of a relapse, after the extirpation of cancerous tumors, to be greater in the more early periods of the disease, than in their more advanced states. *Critical Inquiry*, 4th edit. p. 108.

The extirpation of the testicle being at last resolved upon, the method of performing the operation is this: The patient must be laid on a table, of a convenient height, with his legs hanging down, and firmly secured by two assistants on each side; one at each arm, and another supporting each leg. The parts being previously shaved, if the tumor is large, an assistant must be employed to secure it; if only, however, of a moderate size, it is better for the surgeon to do it himself. With one hand, therefore, he should grasp the swelling, so as to keep it firm, and, with a scalpel in the other, an incision should be made along the whole course of it, beginning at least an inch above the part where the cord is to be cut, and continuing it through the skin and cellular substance, to the inferior part of the scrotum. The easiest method of doing it, both for the surgeon and patient, is by one continued stroke of the knife, as it is both more quickly and more neatly performed in this manner, than in the usual

usual way of pinching up the skin between the finger and thumb, before cutting it ; and there is no kind of difficulty or risk in doing it in this manner.

The spermatic cord being thus laid bare, the surgeon, with the finger and thumb of one hand, should raise it from the parts beneath, so as to be enabled to pass a broad waxed ligature round it : It is easily done with a large curved needle, or even with a blunt probe, with an eye at one end. With this ligature, a running knot should be made upon the cord, about half an inch above where it is to be divided.

The cord being at this part cut across with the scalpel, the testicle is then to be entirely removed, by dissecting the cord and it from above downwards, so as to separate them as easily as possible from the surrounding parts, without injuring the sound skin with which they were covered. Different instruments have been proposed for facilitating the separation of the testis from the contiguous parts ; but

none

none with which we are acquainted, answers the purpose so well, or with such expedition as a scalpel.

When the diseased parts are removed, any arteries of the scrotum that have been divided, should be first secured with ligatures, by means of the tenaculum. This being done, the spermatic artery and vein should be gently separated from the nerve with which they are in contact, and, by the aid of a tenaculum, should be tied with a small ligature of waxed silk. By including the nerve in the ligature, as is commonly done, we render this the most painful part of the operation, while no advantage whatever is gained by it.

The ligature previously passed round the cord, should be untied ; but it should not be withdrawn: Lest the ligatures of the spermatic artery and vein should give way, this ligature should be allowed to remain during the first eight or ten days of the cure, and, being perfectly loose, no harm can be done by it. It is meant merely as an additional security, and to serve as a

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kind of tourniquet, in the event of any hæmorrhage taking place ; so that, in circumstances such as we are now considering, it ought always to be left loose. There is, in fact, no more necessity for allowing this ligature to remain tied, than for leaving a tourniquet firmly applied upon any of the extremities after the operation of amputation ; and yet, instead of one ligature, such as this, it has been the practice with many to apply two, about half an inch distant from each other ; and these they leave firmly tied upon the whole substance of the cord during the cure of the fore*.

There is, however, no necessity for this precaution, as all manner of risk may be prevented, by securing the blood-vessels in the manner I have pointed out. I have often done the operation in this way, and no hazard has ever ensued from it. By
leaving

* Even the late Mr Sharpe gives these directions
Vide Treatise on the Operations of Surgery, 10th edit.
P. 55.

leaving the ligature at the upper part of the wound untied, it may be made use of, as I have already observed, to compress the cord, in the event of the blood-vessels bursting out again; but, when the ligature upon the spermatic artery and vein is properly applied, this will never happen; and when it occurs from neglect or mismanagement, any severe hæmorrhage may always be prevented by the ligature left for that purpose.

On the different blood-vessels being secured, the edges of the cut should be laid exactly together, and secured with adhesive plaster, when the retraction is inconsiderable; and, with the interrupted suture, when it appears from the retraction that takes place, to be necessary. At the same time, care should be taken to leave the ends of the ligatures employed for securing the blood-vessels, hanging out at the edges of the wound, to admit of their being withdrawn, when, in the course of the cure, they appear to have become loose. The whole scrotum should be covered

vered with a pledgit of soft linen, spread with saturnine cerate; and a cushion of tow, covered with old linen, being laid over it, the whole should be secured with a suspensory bag, or the T bandage.

At the end of the second or third day, the dressings should be removed: It is easily done, when the parts are covered in the manner I have advised, with cerate; and it always keeps the patient more comfortable than when the first dressing is long delayed. For the same reason, the dressings should be renewed daily. In the course of eight or ten days, the ligatures commonly separate, and are easily taken away. About the same period, the ligature passed beneath the spermatic cord may be withdrawn; and, by the fourteenth or fifteenth day, the cure, when conducted in this manner, is for the most part complete.

Hitherto we have been supposing that the teguments covering the testicle are sound, in which case none of them should ever be taken away; but, when the skin

has become thin and inflamed, and especially when any of it is in a state of ulceration, all such parts of it should be removed along with the testicle. In such circumstances, the best method of doing the operation is this : Instead of a longitudinal cut along the course of the testicle, the first incision should be carried in a straight line to the under extremity of the spermatic cord, from whence two semilunar incisions should be continued to the under part of the scrotum, and, in their course, should be made to include all diseased parts of the skin.

The remainder of the operation should be finished in the manner described above, and the skin included in the two semilunar cuts is not to be dissected off by itself, but removed along with the diseased testicle.

Even where a considerable portion of the teguments have been removed, the fore may be covered with skin; nor should this ever be omitted, when we find that it can be done; for it not only hastens

the cure, but serves as a more firm protection to the end of the spermatic process, septum scroti, and contiguous parts, than the new scarf skin, with which alone they would otherwise be covered. But, when the remaining teguments will not stretch so much as to admit of their being retained either with plasters or sutures, the cure must necessarily be conducted in the usual way, by dressing with pledgits of any emollient ointment, till a cicatrix is induced. The advantages, however, that we derive from being able to cover the fore entirely with skin, are so great, that every operator should keep it anxiously in view ; for, besides those I have mentioned, it saves a great deal of pain and confinement, to which the patient must otherwise submit. It admits, indeed, of a cure in the fourth part of the time commonly required when the edges of the skin cannot be kept together.

From the descriptions usually given of the operation of castration, we would be induced to consider it as one of the most
simple,

simple, as well as the most easy in surgery ; and it must be admitted, that, in the early stages of a sarcocèle, scarcely any difficulty ever attends it. But it is right that the younger part of the profession should be informed of what all practitioners of experience must have had opportunities of observing, that scarcely any operation is productive of more perplexing occurrences in the advanced periods of the disease.

When the spermatic cord is so far diseased, that we are obliged to divide it near the abdominal muscles, if the upper part of it is not previously secured with a ligature, it is apt to retract within the abdomen, so as to render it impossible to secure it in any other manner than by dividing the abdominal muscles. Of this I have now been present at two instances, in both of which the cord retracted suddenly, and with a smart jerk, instantly on being divided.

In the one no ligature had been applied, as the assistant imagined that he

could secure the cord between his finger and thumb, till the spermatic artery could be tied, but in which he was mistaken; and, in the other, the ligature not being tied sufficiently tight, it slipped off from the end of the cord; and, in both instances, the patients died of the effect of the hæmorrhage. External pressure was the only remedy that could be employed; but although in both instances it gave, from time to time, a temporary check to the discharge, it did not, in either case, prove effectual; so that, after various returns of the hæmorrhage, the patients were at last carried off by inanition.

In all cases, therefore, where the cord must be cut in the upper part of it, a strong ligature should be previously firmly tied, as far as possible above the part in which the division is to be. It should be applied with a running knot, and left of such a length as to admit of the ends of it hanging freely out of the wound, after any retraction that may take place. Being made with a running knot, it may
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be easily undone, whenever it may be supposed that no hæmorrhage will occur on its being withdrawn; and, if the end of the ligature is twice passed through the first noose, it will be sufficiently firm.

The pain attending this mode of applying the ligature, is, no doubt, much greater than when the nerve is avoided; but, in the situation to which I allude, where the cord is cut near to the abdominal muscles, this cannot, with safety, be done, and should not therefore be attempted.

In considerable enlargements of the testis, the tumor is apt to press so much upon the septum scroti, and, in some instances, adheres to it so firmly, that the cavity of the tunica vaginalis of the opposite side is sometimes opened in the course of the operation. Of this, I have been present at different instances: In some, no inconvenience ensued from it; but, in others, inflammation, to an extensive degree, was induced in the corresponding testicle. With sufficient caution, however,

ever, in the removal of the tumor, all this may be prevented; for, however large it may be, the dissection may be always accomplished without perforating the septum. When it is perceived, however, that an opening is by accident made in it, in order to prevent that inflammation of the testis which free access of air very seldom fails to induce, I would advise the divided parts to be neatly and gently drawn together with a ligature, in such a manner as to admit of its being easily withdrawn in the course of the cure. By this, we also prevent blood and matter from finding access to the tunica vaginalis.

But the most distressful part of this operation arises from that enlarged state of the arteries of the scrotum, which takes place in every instance where the tumor has acquired a great bulk, and from which practitioners occasionally meet with more embarrassment than is usually experienced in any other operation. Instead of one, two, or three arteries, very inconsiderable
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in size, which, in the first stages of the disease, are all that we perceive, in the more advanced states of it, we sometimes meet with six, eight, or even more, and all or many of them of such a size as to require immediate attention.

In this period of the disease, the patient is commonly weak and delicate; so that, not being able to bear the loss of much blood, his strength would sink, if arteries of the size which these often acquire were allowed to bleed during the remainder of the operation. During the removal of the tumor, one or more assistants should be employed for the sole purpose of putting a stop to the discharge, by placing a finger upon every artery, as soon as they perceive it to be cut; nor should the pressure be removed till the dissection is finished, and the surgeon in readiness to secure the bleeding vessel with a tenaculum and ligature. This being done over the whole surface of the sore, he next proceeds to tie the spermatic

tic artery, and to finish the operation in the manner I have mentioned.

From want of this attention, I have known such quantities of blood lost, as have either proved quickly fatal, or induced such debility and relaxation, as the patient never recovered from; and, as I have in different instances known even surgeons of experience fail in the proper management of this part of the operation, I think it right to say, that the younger part of the profession cannot be too much on their guard in performing it.

Besides the common form of sarcocoele, that I have thus given an account of, we find, that, in all workers among foot, the testis is liable to be attacked with cancer that first begins in the scrotum.

It first appears on the anterior and under part of the scrotum, sometimes in the form of a warty excrescence, and in others of a foul, superficial ulcer, with hard retorted edges. From the suspicious situation of the sore, and from the appearances

pearances which it exhibits at first, it is often suspected to be venereal ; but no advantage is derived from mercury, nor from any dressings that may be employed. If not prevented by early extirpation, the ulcer spreads over the scrotum, and from thence to the testis, spermatic cord, and inguinal glands ; giving to the parts that it attacks all the ordinary and characteristic marks of cancer.

This variety of cancer appears obviously to be produced by foot ; for it is found, that, besides chimney-sweeps, those who are employed in manufactures in which foot enters as an ingredient, are occasionally seized with it. And it also appears, that the foot acts altogether locally in producing it ; for, when the sore is extirpated early, that is, soon after it has appeared, and before it has spread over any great extent of surface, the disease seldom returns, either there or on any other part.

As no other remedy has been discovered, for none that I have either tried or heard of, has any influence in curing the
sore,

fore, I would therefore advise the diseased parts to be extirpated as early as possible. This, while the ulceration is confined to the scrotum, is easy both to the patient and surgeon, when compared with the operation of castration, which must always take place when the testis becomes diseased, and is therefore a strong inducement for our insisting that no time should ever be lost in putting it in practice.

I may farther observe, that arsenic, caustic, red precipitate, corrosive sublimate, and other irritating applications, produce the same effects in this as in other varieties of cancer.

When applied so as to remove the diseased parts entirely, they perform with much more pain, and in a much more tedious manner, what may be more neatly done by the scalpel at once: While, so far as I have observed, none of them are productive of any other advantages, at the same time that, by the irritation which they excite, they very frequently do much harm.

Many

Many accounts have been communicated to the public of this and other varieties of cancer being cured by escharotics of different kinds, and chiefly by arsenic, which appears to form the basis of a great proportion of the remedies of this class, that have been employed for the cure of this disease. But, while all of these, as well as the internal use of hemlock, and of every other medicine I have known employed, have failed in every instance, they have very commonly had the effect of amusing the patient with hopes of a recovery, till it has been too late even for the extirpation of the diseased parts, to prove successful.

I have, therefore, no hesitation in asserting, that the operation should be advised in the early stages of the disease, and that no other remedy, with which we are yet acquainted, should ever be relied on.

Besides those affections of the testes and their coverings, that I have described, there is another, that seems to be peculiar
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to warm climates. It is met with frequently on the coast of Africa, and in the West Indies, in some instances in Europeans, but chiefly in Negroes.

An uniform, firm, colourless swelling attacks the whole substance of the scrotum. It is seldom, for a considerable time at first accompanied with pain; but, when it passes from the cellular substance of the scrotum to the testes themselves, which, in some instances, happens, it, in this state, always excites a great deal of distress.

In the early stages of the disease, the external application of astringents, accompanied with a course of mercury, has, in some instances, proved useful. But, when the tumor has become large, a cure has never been obtained of it. In this situation the patient obtains no relief, but from a proper application of a suspensory bag, and, in severe degrees of pain, from large doses of opium.

CHAPTER XXVIII.

Of the Diseases of the PENIS.

SECTION I.

Of the Phymosis.

THE glans penis is naturally provided with a covering termed the Præputium; formed by an elongation and doubling of the skin. This in a healthy state is in general of such dimensions as to pass easily over the glans, but by disease it is frequently prevented from doing so; and when the prepuce has got forward, and

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cannot be drawn back over the glans, the disease thereby produced is termed a Phymosis.

Phymosis is induced by whatever tends to swell the glans, or excite inflammation and stricture in the preputium: Hence it is a frequent consequence of gonorrhœa virulenta, and lues venerea; and it sometimes occurs from want of cleanliness, particularly in those who are naturally liable to a plentiful exudation of viscid mucus between the glans and preputium.

Where the disease is slight and not of long duration, fomenting the parts in any warm emollient decoction, commonly gives relief; or what answers better for such purposes than any decoction, is warm milk; this, together with the use of emollient poultices, with a view to relax the constricted preputium, often answers so effectually as to render other applications unnecessary.

At the same time that fomentations and poultices are advised, a weak saturnine solution should be injected from time to time

time between the prepuce and glans, with a syringe, in order to wash away any matter which by its acrimony might tend to protract the disease.

When the parts are much inflamed, blood-letting often proves useful. When the superficial veins of the penis can be opened, any blood to be discharged should be taken from one of them by the lancet; but when they do not appear conspicuous, discharging it from the arm will answer as well as from any other part: Local blood-letting with leeches would be here particularly indicated; but when the disease has arisen from lues venerea, the bites of these animals almost constantly terminate in troublesome sores. Together with a discharge of blood proportioned to the strength of the patient, gentle laxatives should be prescribed, a low diet, and abstinence from exercise.

When, however, it is found, that even a due perseverance in these means does not remove the disease, and especially if chancres are confined under the prepuce,

which might injure the glans by the matter discharged from them not getting a proper vent, in that case it becomes necessary to remove the stricture by an incision carried along the whole course of the preputium.

As the skin of the prepuce is exceedingly lax, it is almost impossible to cut it with neatness and accuracy in the ordinary way, either with a scalpel or bistoury; and when done in this manner, the skin yields so much before the instrument, as always to render the operation tedious and painful: Neither are the probe-scissars well calculated for doing it properly, as the parts are commonly so much thickened by inflammation, that they cannot be rightly cut with scissars.

These inconveniencies being obvious, many inventions have been proposed for doing the operation more easily. In Plate LXVIII. figures 1. 2. and 3. is represented an instrument which I made for this purpose several years ago, and it answers the intention very effectually and with much ease.

It consists of a director, fig. 2. with a small curve at its extremity, to which a sharp-pointed bistoury, fig. 1. with a narrow blade, is so exactly adapted, as in fig. 3. that the cutting part of it is entirely concealed in the groove of the director, which ought to be about a quarter of an inch longer than the blade of the knife.

The knife being inserted into the director so as to be covered by it entirely, the instrument in this state is to be passed between the prepuce and glans on one side of the penis, till the director is found by the finger to have reached the upper end of the preputium. The operator is now to keep the director firm with one hand, and with the other is to push the knife forward, so as to make its point pass through the prepuce; and the director being withdrawn, the operation is finished by drawing the knife forward so as to make it divide the prepuce through its whole length along the side of the penis.

In this manner the preputium is preserved in a tense state while the division is

going on, by which means the operation is accomplished with ease: And, by dividing the preputium on one side we more readily avoid the large veins of the penis, at the same time that the matter proceeding from the cut is more easily discharged, than when the operation is done on the back part of the penis.

The prepuce being thus divided, the parts should be bathed with warm water so as to wash off any acrid matter with which they may be covered; and this being done, the fore should be covered with soft lint; and a compress of old linen being laid over it, the whole may be easily retained by a small linen bag adapted to the size of the penis, to be secured by two straps pinned to a circular bandage made to surround the body. This bag must indeed be always removed when the patient makes water; but this is easily done; and it retains the dressings, not only more effectually, but with more ease to the patient, than is done either with

adhesive

adhesive plaisters or any other form of bandage.

In the after-dressings of the fore, care should be taken to insert a piece of soft lint between the divided prepuce and glans, otherwise troublesome adhesions are apt to take place. I have met with several instances of this, which gave much distress to the patients, and which, with due care and attention in dressing the fores, might easily have been prevented.

It is scarcely necessary to observe, that when any venereal infection subsists in the constitution, the fore produced by this operation will not readily heal, if the patient be not put under mercury. In such circumstances, therefore, if mercury has not been previously given, it ought always to be prescribed immediately on the operation taking place.

In some cases of phymosis, the prepuce is so long, that the operation of circumcision answers the purpose better than a longitudinal cut. And it is easily done, by taking away all the superabundant

portion of the prepuce by one stroke of a scalpel. It sometimes, however, happens, when the operation is done in this manner, that the remainder of the preputium contracts so powerfully, as to produce a good deal of distress; which can only be obviated by due attention to the after treatment of the fore, and making use of emollients, instead of astringent applications during the cure.

SECTION II.

Of the Paraphymosis.

BY the term Paraphymosis is meant a morbid retraction of the preputium, producing stricture behind the glans penis. This disease, like the former, is a frequent symptom in the venereal disease: but it will arise from whatever tends to produce, either a preternatural fulness in the glans, or a constriction of the prepuce; and more especially from such causes as induce a complication of both.

In the incipient state of paraphymosis, we may often with due dexterity and attention bring the prepuce over the glans, by pushing the nut gently back with the thumb of each hand, while with the fingers we draw the prepuce easily forward.

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In the more advanced state of the disease, however, no attempt of this kind should be advised, as it is in the commencement of it only that it ever succeeds; and when it does not prove useful, it is apt to do harm, by inducing an increased degree of irritation in the parts to which the pressure is applied.

As the paraphymosis seems to be more frequently induced by an enlargement of the glans than by any original affection of the prepuce, so the stricture in the prepuce is not here so completely relieved by emollient fomentations, as it commonly is in the phymosis, where the disease is most frequently produced by a stricture of the prepuce alone. In paraphymosis, indeed, warm emollients seem rather to do harm, as they tend evidently to increase the swelling in the glans, by which the stricture in the prepuce is always proportionally increased.

Nothing in general answers so well here as saturnine applications. The swelling,
indeed,

indeed, will often subside by being frequently immersed in a cold solution of saccharum saturni, when all other remedies fail. But, when the penis is evidently much swelled and inflamed, together with this application to the part, the patient should be kept cool, gentle laxatives should be prescribed, and blood should be taken from one of the superficial veins of the penis.

By due perseverance in these means, and keeping the patient on low diet, the stricture is frequently removed. But, when the disease proceeds to increase, by the swelling in the glans becoming more considerable, and the stricture of the prepuce increasing, the preputium becomes œdematous, and unless relief be soon obtained by a complete removal of the stricture, gangrene of the glans very commonly ensues.

When, therefore, none of the remedies I have mentioned prove effectual, we should endeavour to remove the stricture
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by an operation; and the easiest method of performing it is, with the shoulder of a lancet, or a small scalpel or bistoury, to make a deep scarification on each side of the penis, directly behind the glans; taking care to make each cut of about half an inch in length, and of such a depth as effectually to divide the prepuce just at the spot where the stricture is most considerable.

The parts should now be allowed to bleed freely, as this circumstance of itself in general affords relief; and as soon as the flow of blood is over, a pledgit of any emollient ointment being applied to the sores, and a soft well-made poultice being laid over the whole, if the scarifications have been carried entirely through the stricture, nothing farther will be necessary than dressing the parts daily with the same ointment with which they were at first covered: but, if the scarifications have not been made of a sufficient depth, it may afterwards be necessary to renew them; when care must be taken that they are effectually done.

In the phymosis, I advised the patient to be put under a mercurial course whenever there is reason to suspect that he is infected with lues venerea; and the same precaution, it is evident, is equally proper in paraphymosis.

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SECTION III.

Of Amputation of the Penis, &c.

THE penis, like other parts of the body, is liable to diseases, which in some instances render amputation necessary.

Thus, in some instances it is attacked with gangrene, and in others with cancer, in both of which amputation is very commonly requisite.

I have elsewhere entered fully into the consideration both of mortification and cancer *. Referring, therefore, to the observations that I had there occasion to suggest, we shall at present only advert to the mode of amputating the penis when it becomes so diseased as to render this operation necessary.

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* Vide Chap. I. Sect. IV. and Chap. V. Sect. VIII.

A circular incision should be first made through the sound skin at the upper end of the diseased parts, when the skin being drawn back by an assistant, the body of the penis should be cut through by one stroke of the scalpel, care being taken to remove every part that appears to be diseased.

This being done, such arteries as bleed freely should be carefully searched for, and secured with ligatures. In general, two, and sometimes three arteries are met with; and they should all be secured in this manner. But even after the principal arteries have been tied, a considerable oozing of blood usually continues from the surface of the sore, which we sometimes stop by sprinkling with starch or gum arabic in fine powder; but when this does not answer, a small silver canula being passed into the urethra, and retained with a bandage, any farther discharge of blood may be easily stopt by slight compression with a narrow roller on the parts that remain. A slight degree

gree of compression answers the purpose, such a degree of it indeed as does not hurt the parts on which it is made; and as the tube inserted into the urethra need not be long, it is easily retained during the whole course of the cure, without either inconvenience or distress.

In Plate LXV. fig. 4. is represented a tube which I have in different instances used for this purpose. It is easily kept in its situation by fixing it with two ligatures, one on each side, to a narrow roller round the penis.

Heister, as well as others, being afraid of the hemorrhagy produced by amputating the penis, advise it to be done with a strong ligature. A ligature being applied with firmness above the diseased parts, they are thereby made to fall off in the course of six or eight days; but whenever a part can be safely removed with the scalpel, it is done with much more ease and expedition than in any other manner.

Others, again, have said, that no danger is to be dreaded from any discharge of

of blood that can ever ensue from amputating the penis; but this I know from experience is not the case. In the course of a few months, I had occasion to perform this operation three different times in the Royal Infirmary here; and in the first I was persuaded by a gentleman who had found it in one case to succeed, not to secure the arteries with ligatures, but to trust to compression alone. This was accordingly done; but unfortunately, in the course of an hour or two after the operation, such a profuse hemorrhagy supervened as terminated in the patient's death.

In the next, I was resolved to secure every branch of an artery that could be laid hold of. Three different arteries were accordingly tied, and no hemorrhagy ensued. In the third operation two branches of an artery were secured; but a plentiful oozing still continuing from the fore, the silver tube above mentioned was introduced into the urethra, and a slight compression being made up-

on it, the discharge was immediately stopped.

When all the arteries, for we frequently meet with three or four, have been secured in this manner, the parts should be covered with pieces of soft lint sprinkled with starch or gum arabic in powder; and a compress of linen, with a hole in it large enough to pass over the canula in the urethra, being laid over the whole, and the T-bandage being employed to retain it, all the dressings may in this manner be secured; while the after treatment of the fore should be similar to that of wounds in any other part.

In proceeding to this operation it ought to be kept in view, that the prepuce is frequently so much enlarged and ulcerated, as to give cause to suspect that the glans as well as the rest of the penis is diseased, when in reality they are perfectly sound. I was once present at an operation, where the previous appearances were such as gave no reason to doubt of the glans being diseased, the prepuce with part of the penis was accordingly

cordingly taken off, when it afterwards appeared that the glans might have been saved, as the disease was found to be confined to the prepuce alone.

In every case, therefore, where we are not absolutely certain of the glans being affected, all the diseased preputium should be first removed; and the state of the parts below being examined, if they are found to be so much diseased as to render it necessary to remove them, it can be then done with as much ease as if they had been taken off along with the prepuce; while on the contrary, when they appear to be sound, the surgeon as well as the patient will have much cause to rejoice.

It sometimes happens, that the frenum of the penis is so short as to excite much uneasiness when the parts are in a state of erection. But as no danger ensues from a division of this ligament, whenever it proves troublesome it ought to be cut across; and it is easily done with probe-pointed scissors: After the frenum

is divided, a bit of soft lint should be inserted between the lips of the wound, otherwise the parts newly separated will be apt to re-unite.

In some instances, the urethra in male children is incomplete, and terminates before it reaches the point of the yard. In others no external opening can be discovered, while in many the urethra terminates in a small opening, not large enough to admit a small pin-head, at some distance from the end of the penis.

When no opening is discovered, if the urine is found to stop at any particular part, the introduction of a small trocar from the point of the yard along the course that the urethra ought to take, and carrying it forward till it meets with the urine, will give immediate relief; and by the use of small bougies the sides of the passage may be rendered callous, and a clear opening preserved. But when any opening is discovered, although it should not be properly placed, if it affords a temporary passage to the urine, it is better to delay the operation till the patient is ad-
vanced

vanced in life ; and on an opening being then made with a trocar in the manner I have mentioned, a piece of flexible catheter of elastic rosin may be introduced, not only for preserving the passage free and pervious, but for carrying off the water till a cure is obtained. In the earlier periods of childhood, the smallness of parts through which it ought to pass, renders the catheter altogether inadmissible.

Besides the affections of the penis that we have been just considering, fistulous openings frequently form in the urethra, and they always give much distress. These however, as well as the treatment of Stones impacted in the Urethra, will fall to be considered hereafter.

CHAPTER XXIX.

Of the Stone.

SECTION I.

General Remarks on Urinary Calculi.

PARTICLES of stone have been known to form in almost every cavity of the body, but they are more frequently met with in the organs of urine than in other parts.

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The blood, as well as the various secretions which it affords, are, by experiment, found to contain a considerable proportion of earth: When this earthy part of our fluids is in a proper or natural quantity, and when not separated by disease, it continues to circulate along with the other parts of which these fluids are composed; and in this state no harm ever ensues from it. Various causes, however, may concur to produce a deposition of this earthy matter from the blood and its secretions.

I. We know, that every liquid can dissolve and keep suspended a certain quantity, and no more, of those substances of which it is a menstruum; and it is likewise known, when a greater proportion than this is added, that a separation and consequent deposition takes place of all the additional quantity. In like manner, we may suppose, if the lacteal vessels ever absorb a greater proportion of earthy matter from the contents of the intestines than the quantity of fluids in the circulating

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lating system can keep suspended, that this superabundance of earth must necessarily separate from the rest: And the depositions thus produced are much more likely to occur in the bladder and kidneys than in other parts, from the urine being known to contain a greater proportion of earth than any other secretion.

2. Independent of other causes which may tend to induce a superabundant quantity of earthy matter in the blood, such articles of food as contain a large proportion of earth have been supposed to be more productive of it than others: But unless such quantities of earth as are contained in food, be conveyed in a state of the most perfect solution, any effect that may result from it will not probably be of much importance. There is much reason, however, to think, that a long-continued use, either of water or of wines, abounding with earth in a dissolved state, has a considerable tendency to
produce

produce that state of the blood to which I allude.

3. People much accustomed to live upon solid food, will be more liable to the effects of a large proportion of earthy matter in the blood, than those who by a free use of liquids are in the habit of preserving a more plentiful and more diluted state of the secretions. And, accordingly, in such patients as are frequently voiding particles of sand, and even of small calculi, I have known more advantages derived from a continued and plentiful use of diluent drinks, than from any other remedy. A liberal use of watery fluids may, no doubt, operate to much advantage, by washing away particles of sand and stone already formed and lodged in some of the organs of urine; but they seem likewise to prove useful, merely by their diluent properties.

4. A superabundance of earthy matter being once produced in the blood, various circumstances will concur to form depositions of it in the different cavities :

Of these a sedentary life is, perhaps, one of the most remarkable; and hence it probably is, that such people are found to be most liable to calculous complaints, whose occupations require the least bodily exertion.

It must indeed be allowed, that stone in the bladder is frequently met with amongst indigent and industrious labourers; whose necessities, at all times, prevent their indulging in indolence. In such instances, however, it may be supposed, that the very coarse articles of food, with which people in this line of life are chiefly nourished, will tend to impregnate the blood with such a large proportion of earth, as must necessarily produce effects not to be obviated, even by the beneficial influence of a continued and regular course of exercise.

5. Whatever influence a predisposition in the system may have in the formation of calculus, and in its subsequent increase of bulk, the introduction of any substance that can serve as a nucleus, will almost
certainly

certainly produce a stone, in whatever cavity it is lodged. Thus, a particle of sand, of blood, or coagulable lymph, may, in consequence of spasm or inflammation, be confined in the pelvis of one of the kidneys, or in the cavity of the bladder, and may soon acquire such a size, from the constant addition of earthy matter that it receives, as to make it impossible for the urine to carry it off: And urinary calculi, thus begun to be formed, will acquire, sooner or later, a considerable bulk, according to the quantity of earth with which the urine is impregnated. Thus instances have occurred of stones becoming large, in the space of a few months from the first obvious symptoms produced by them; while, at other times, they have been known to remain in the bladder for a great many years, without arriving at any size of importance.

When speaking of nuclei, it is necessary to remark, that their effect in the formation of calculi, in the urinary passages especially, appears to be so great,
that

that it may be doubted whether a stone is ever known to form in these parts without the intervention of this cause ; for, however large the quantity of earth contained in urine may be, it would probably all flow off by the urethra, if it was not detained by the accidental introduction or formation of a nucleus.

Nuclei of different kinds, such as hairs, needles, musket and pistol bullets, pieces of bougies, and a variety of other articles, have been met with in the centre of urinary calculi ; but particles of blood, or of coagulable lymph, are most frequently found to produce them.

By the difference of food used at different periods of the disease ; by the stone being formed slowly or more quickly ; and perhaps, by the intervention of other causes which are not always known, and which, if known, could not be easily explained ; it commonly happens, that the different lamellæ of which human calculi are composed, vary considerably both in colour and consistence ; a crust of a soft friable

friable-nature being frequently known to cover one of a texture equal in hardness to the most solid marble; while this again is found to surround a stratum not firmer than a piece of dough.

Whatever may be the immediate cause of this difference of consistence in stones, and even of different parts of the same stone, is of little importance in practice: But we know from experience, that the symptoms produced by calculi formed of hard compact materials, are in general more severe than such as arise from those of a softer texture; and we likewise know, that the surface of stones being smooth or ragged, has much more influence than any other circumstance in the violence of the symptoms which they produce: Much variety too, it may be remarked, is met with in human calculi with respect to the smoothness of their surfaces; some being perfectly polished, while others are covered with hard sharp points.

The violence of symptoms in this disease, is commonly in proportion to the
size

size of the stone; stones of the greatest bulk being for the most part attended with the most severe pain. This, however, is not always the case; for instances sometimes occur of the most severe symptoms being induced by small stones; whilst in others, stones of a considerable size have been known to subsist for a great length of time without inducing much pain: But in general it is otherwise, and the symptoms are most frequently mild or severe, according as the stone by which they are produced is small or large.

When a stone has acquired such a size that it cannot pass off from the urethra, the patient becomes liable to symptoms which from their commencement give much uneasiness, and which, in the event, commonly terminate in the most afflicting scenes of distress to which the human frame is liable.

One of the first symptoms of stone, is an uneasy sensation at the point of the yard, which for some time is only discovered

vered on the patient taking violent and jolting exercise, or immediately after voiding urine. This pain by degrees becomes more frequent and more severe. The patient has a strong propensity to pass urine frequently, and commonly voids it in small quantities, perhaps even drop by drop.

When flowing in a full stream, it often stops suddenly; and this it is most apt to do when a considerable quantity is collected, and when of course the patient's desire for voiding it is strongest. Nor does the pressure usually made by the patient answer any good purpose: For, as the interruption to the flow of urine proceeds from the weight of the stone bearing against the neck of the bladder and orifice of the urethra, nothing will produce a free return of it but an alteration in the site of the stone, which is more readily accomplished by the patient changing the posture of his body, and particularly by the pelvis being more or less elevated, than by all the pressure that he can employ for forcing it out.

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The urine of calculous patients is sometimes perfectly clear, but most frequently it is thick, and deposits a mucous sediment, and in some instances, when the disease is violent, and the paroxysms frequent in their return, it is tinged with blood. When the stone is large, a dull uneasy sensation at all times takes place about the neck of the bladder; and the irritation produced by it frequently excites a very troublesome degree of tenesmus, or a constant and painful desire to go to stool.

All these symptoms are uniformly increased by exercise, particularly by riding on horseback; and from a long continuance of pain, and from that want of rest which frequent returns of the paroxysms are sure to induce, the patient's state of health by degrees becomes impaired; and unless the stone is now removed, it commonly happens that his misery is only terminated by death.

When all or most of the symptoms I have enumerated occur in the same patient

tient, there can be no great reason to doubt of the cause by which they are produced; and we know with certainty that they proceed from calculus, when fragments of stone, or perhaps when sundry small stones, continue to be passed from time to time along with the urine: But when this does not occur, we can never with certainty know whether the symptoms originate from stone or not; for instances frequently happen of all the symptoms usually produced by stone in the bladder, arising from an ulcer or tumor either in the body of that organ, or in its neck, or even from tumors on the contiguous parts when they press upon the neck of the bladder.

A surgeon accustomed to this branch of practice, will in general be able to judge from the symptoms, whether a stone actually exists in the bladder or not; but the only certain means by which it can be ascertained, is through the intervention of a sound, or curved probe; different sizes of which are represented in

Plate LXIX. By passing this instrument into the bladder, in the manner I shall afterwards direct, if it touches a stone, such a sensation is thereby communicated to the operator, as gives ample conviction of the real cause of the disease.

SECTION II.

Of Sounding or Searching for the Stone. .

BEFORE describing the operation of sounding, it will be proper to give an anatomical description of such parts as are concerned in it; and to this I shall add an account of those parts that are most immediately injured by the various operations of lithotomy: These are, the kidneys, ureters, urinary bladder, pelvis, vesiculæ seminales and their ducts, prostate gland, urethra, penis, some of the muscles of the penis, and part of the abdominal muscles.

A minute description of these parts would lead to an extensive discussion inconsistent with the nature of this undertaking; and as such a description is not

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necessary,

neceſſary, I ſhall only give ſuch an account of the parts as may ſerve to render intelligible the deſcription to be afterwards given of the operations to be performed on them.

The kidneys are two glandular bodies lying in the back part of the abdomen, on the upper part of the pſoæ muſcles; the right being ſeated immediately below the great lobe of the liver, and the left under the ſpleen; and they are both, I may remark, almoſt completely covered by the ſlight curvatures of the inferior false ribs. They are ſupplied with blood-veſſels, termed the Emulgent Arteries and Veins, directly from the trunks of the aorta and vena cava. The uſe of theſe organs is to ſeparate the urine from the blood, which, as ſoon as it is ſecreted, is carried by means of two canals or tubes, one from each kidney, termed the Ureters, directly to the veſica urinaria. The ureters, after leaving the kidneys, proceed obliquely downwards behind the ſpermatic veſſels, over the os ſacrum; and

paſſing

passing in between the bladder and rectum, they are inserted into the former near to its neck, at a small distance from one another; and after piercing the external coat of the bladder, they run obliquely for a short space between it and the more internal covering of that organ before penetrating its cavity: A construction well calculated for preventing a reflux of urine to the kidneys.

The pelvis is a kind of box or basin, formed by a conjunction of the os sacrum, os coccyx, and ossa innominata. The cavity formed by a particular combination of these parts, being intended for the protection of the bladder, and some other organs, is every where surrounded with bone, or with strong ligaments, except at its upper and inferior parts, where alone the pelvis is accessible, being here covered with soft parts only. The cavity of the pelvis is chiefly occupied by the bladder, which, when in a distended state, fills it entirely, and even ascends considerably above its brim.

The bladder, or receptacle of the urine, is a membranous bag composed of different coats, one of which is evidently muscular, with its fibres running in different directions. The human bladder is of an irregular oblong figure. The superior part of it has commonly been termed its Fundus, or Bottom: The opposite extremity lying at the bottom of the pelvis, is termed the Cervix or Neck; and the intermediate space, its Middle or Body. The bladder is every where nearly, though not exactly, of the same diameter, except at its fundus, where it is somewhat contracted; and again near to its neck, where it dilates considerably, extending back towards the coccyx.

The superior part of the bladder is covered with the peritonæum; and it therefore lies; along with the other abdominal viscera, within the abdominal cavity; but the under part of it is not covered with that membrane. The anterior under part of the bladder is connected by cellular substance to the pubes; lateral-

ly, it is fixed by productions of its external covering to the other bones of the pelvis; and posteriorly, it is in male subjects firmly connected with the rectum, from the entrance of that gut into the pelvis, till within a little of its termination in the anus, when the neck of the bladder and commencement of the urethra separate a little from the gut, leaving a space that is filled with fat and cellular substance.

In females, the uterus, in an unimpregnated state, lies altogether in the cavity of the pelvis immediately behind the bladder; and the vagina, in which the *os tinæ* terminates, lies directly behind the urethra, and before or upon the intestine rectum, to which it is firmly attached.

The neck of the bladder terminates in the commencement of a cylindrical membranous canal, the urethra, which comes off at nearly a right angle from the anterior part of it. The urethra, at its commencement, is surrounded by the pro-

state, a gland of a flat pyramidal shape, with its base towards the bladder, and its apex pointing to the perinæum; its superior lamella being connected with the pubes, and its inferior part with the anterior and under part of the rectum.

The urethra continues to be entirely membranous for a short space after it leaves the apex of the prostate gland; and this part of it keeps in close contact with the ossa pubis, till it passes out from below the arch formed by these bones, which it does by making a curve in its progress to the perinæum. This curvature in the urethra it is material to be well acquainted with, for in the operation of Sounding, a good deal depends upon this. A good anatomist will in general pass a staff with ease, while those not versant in the anatomy of the parts concerned, are not only apt to fail entirely, but are sure to give much unnecessary pain.

The commencement of the urethra, that I have just described, is termed the
3 Membranous

Membranous part of it; which, before it has proceeded an inch from the extremity of the prostate gland, is surrounded by a cellular kind of body, termed the *Corpus Spongiosum Urethræ*, which here forms a kind of protuberance, termed the *Bulb of the Urethra*; and which afterwards proceeds along in a more diffused state to the extremity of the penis, where, by expanding again, it terminates in the formation of the *Glans Penis*.

The rest of the penis is formed of the *Præputium*, which, as I have already had occasion to observe, is merely a doubling of the skin; and of two round cavernous bodies, termed the *Corpora Cavernosa Penis*, which originate by two crura or legs from part of the os ischium and posterior part of the pubes on each side; and having united near the symphysis pubis, they thus form the principal part of the body of the penis, and are continued to the glans, with which they are connected, but with which the cellular or cavernous parts of these bodies have no direct communication.

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By the junction of the two cavernous parts of the penis, which are nearly round, a kind of hollow is formed both above and below. In the former of these, or in that vacuity which runs along the back part of the penis, the principal veins of the penis run; and the urethra is protected by the latter. The obvious use of the urethra is to serve as a passage for the urine and semen; the receptacle of the former I have already described, and I shall now mention those of the latter. The semen, after being secreted by the testes, is by two very small tubes termed *Vasa Deferentia*, lodged in the *vesiculæ seminales*, which are found to be two cellular kind of canals, contorted in such a manner as when distended to resemble the intestines of a small fowl. They are seated on the posterior part of the neck of the bladder, below the entrance of the ureters, and lie in close contact with the rectum; and the semen is again discharged from these receptacles by two excretory ducts, which terminate in two points, at

a part which, from its figure, has been termed the *Caput Gallinaginis*, situated on the inferior side of the urethra, nearly about the middle of the prostate gland; and a little below the entrance of these canals from the *vesiculæ seminales*, the two excretory ducts of the prostate gland empty themselves into the urethra.

The muscles we have to mention here, as being liable to be injured in the operations of lithotomy, are the *erectores penis*, *acceleratores urinæ*, *transversales perinæi*, and *levator ani*. The *erector penis* arises from the tuberosity of the *ischium*; and, after covering almost completely the crus penis of the same side, it is inserted by a tendinous expansion into the superior part of the penis, near to where it joins with its fellow of the opposite side.

The *accelerator urinæ* arises by fleshy fibres from the *sphincter ani* and contiguous soft parts; and after covering the membranous part of the urethra, it is inserted into the middle of the bulb, where
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it joins with a similar muscle of the opposite side: Part of these muscles, too, run along the crura penis, and are afterwards lost in the ligamentous covering of the corpora cavernosa. The transversales perinæi are two thin narrow muscles, which originate from the firm membranous covering of the tuberosity of the ischium, and, after stretching directly inwards, are inserted into the bulb of the urethra.

Besides these muscles, which all suffer more or less in the lateral operation of lithotomy, the levator ani must necessarily be cut in the same operation; and in the high operation for the stone, part of the musculus transversalis abdominis, of the rectus, and pyramidalis, are also cut.

Almost all these parts are furnished with blood by branches from the internal iliac artery; and those vessels which run most hazard of being cut in the lateral operation for the stone, are, the arteria pudica interna, and the pudica externa: For the former supplies not only the parts about
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the anus, but the bulb of the urethra and the corpora cavernosa ; and the latter, to wit, the pudica externa, supplies a great part of the bladder, the prostate gland, and vesiculæ feminales.

Having thus premised all that is necessary for our purpose, of the anatomy of these parts, I shall now proceed to the operation of sounding.

For the purpose of discharging water collected in the bladder, a curved silver tube is made use of, named a Catheter, different forms of which are delineated in Plates LXX. and LXXII. But for the discovery of a stone in the bladder, a solid instrument made of steel is preferable, as the sensation communicated by a firm substance, is more distinct than when an instrument of silver, or any other softer material, is employed. In females, the urethra runs almost in a straight line ; so that an instrument, either perfectly straight, or nearly so, such as is represented in Plate LXX. fig. 3. is more easily introduced than one with a large curvature: But in
male

male subjects, the turn made by the urethra, when it passes up between the rectum and pubes, is so considerable as to preclude entirely the introduction of a straight instrument, unless much violence is used. By preserving the penis at an acute angle with the body, the course of the urethra may indeed be rendered so straight, that a straight probe may be easily introduced, till it reaches this turn towards the farther extremity of the perinæum; but the curvature made by the urethra at this place, renders it necessary to employ an instrument with a corresponding degree of convexity.

The curvatures commonly given to these instruments are either too great or not considerable enough. Either extreme renders it difficult to obtain a passage into the bladder: For when the staff is made with too much convexity, besides being more difficult to introduce, it gives much unnecessary pain, by stretching and even tearing the urethra, nor can an instrument, with much convexity, be so easily managed,

managed, when in the bladder, as when the curvature given to it is less. In Plate LXIX. sounds are represented of various sizes, and of such degrees of curvature as by experience I have found to answer better than any other. They are taken exactly from the natural curvature of the urethra, the instruments from whence they are delineated having been exactly adapted to that passage, after the surrounding parts were dissected off.

The patient to be sounded should be laid upon a bed, with his head raised upon a pillow, and his thighs somewhat elevated and separated from one another, in which position the muscles of the abdomen are put into a state of relaxation: The surgeon, if he employs his right hand to pass the staff, should stand on the left side of the patient, and the sound should be of a size proportioned to the passage intended to receive it. Having previously brought it to the heat of the patient's body by immersion in warm water, and having dipped it in fine oil, he is now to grasp

grasp the penis with his left hand; and, having introduced the end of the sound into the urethra, with its concave side towards the abdomen of the patient, he must push it easily forwards with his right hand, while at the same time he continues with his left hand to draw the penis gently forward upon the instrument.

The sound being in this manner carried a sufficient length, it will commonly slip easily into the bladder; but, occasionally, we meet with difficulty in passing it through that part of the urethra where it is surrounded by the prostate gland, the instrument being apt to stop when it comes to this part of the passage; and here I must remark, that any force employed for pushing it further, should be applied with the greatest caution. That part of the urethra immediately anterior to the prostate gland being entirely membranous and unsupported, if the sound at this part meets with obstruction, and if still pushed forward with much force, much mischief must necessarily ensue. In this manner

manner the point of the instrument is often forced entirely through the urethra ; by which, instead of getting into the bladder, it forms an artificial passage, either between the bladder and pubes, or between the bladder and rectum ; an occurrence that always excites severe distress ; and which, there is reason to fear, is, either from ignorance or inattention, much more frequent than it ought to be.

In order to guard against the dreadful consequences that result from this, as soon as it is found that the instrument does not pass easily along, the fore-finger of the left hand, being dipped in oil, should be introduced into the rectum, when, by stretching the parts and elevating the point of the staff, while at the same time the instrument is pushed gently forward, we commonly procure an easy entrance into the bladder. By depressing the handle of the sound, we also elevate the point of it, and in this manner its entrance into the bladder is sometimes accomplished ; but in general the introduc-

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tion of the finger into the rectum answers the purpose better.

The introduction of the staff into the bladder, it may be observed, is a very nice operation; and a dexterity in performing it can only be acquired by much practice. Every student, therefore, ought to embrace all opportunities of practising it, first on the dead subject, and afterwards on the living. For every candid practitioner must acknowledge, that he has, in different instances, found the introduction of a catheter, or of a sound, both difficult and uncertain: But when the parts concerned are not much inflamed, swelled or ulcerated, the operation does not often misgive in the hands of an expert surgeon.

The staff being thus introduced, the operator should now lay hold of the handle of the instrument with one hand; and if any part of it falls immediately upon the stone, the business of sounding is at once accomplished, as we are thus rendered cer-
tain

tain of the nature of the disease : But if the stone is not soon discovered, it may commonly be found by moving the instrument, so as to make its point pass easily from one side of the bladder to the other. When the stone, however, is small, and has fallen into that part of the bladder that lies below the entrance of the urethra, the staff is very apt to pass entirely over it. With a view to obviate this difficulty, the finger of the left hand may be again introduced into the rectum, so as to elevate that part of the bladder in which the stone most probably lies concealed. If, again, even this attempt should fail, the patient's body should be put into a different posture ; and no situation will, in general, answer so effectually as lowering the head and upper part of the body, while at the same time we raise the pelvis. In this manner a stone, if not contained in a particular cyst, which it rarely is, may be moved from the projection at the neck of the bladder towards its fundus, where it will be more

readily struck with the sound. But when, even by this posture of the body, we do not succeed, every variety of position ought to be tried: The patient's head may be elevated, and the pelvis depressed; he may be made to stand erect; or, what I have sometimes known to succeed after other attempts had failed, he may be made to stand upon his feet, with his body bending forward.

It sometimes, however, happens, when the stone is small, and the capacity of the bladder large, that our first attempt in sounding fails entirely; but when the symptoms of stone are strongly marked, and when schirrosity and ulceration of the parts, which might give rise to these symptoms, are not found to exist, we ought not to rest satisfied with one, or even with two trials. I have known a stone discovered on the third or fourth sounding, which had escaped the instrument in all the preceding trials.

When a stone is struck with the staff, the sensation it communicates to the operator

rator is of such a particular nature, as to render it impossible for any one versant in this branch of practice to be deceived by it, if he attends sufficiently to the business he is about: But, to those not much accustomed to this business, a hardened state of the bladder itself communicates such a sensation through the staff, as frequently proves the cause of most unfortunate deceptions. Similar deceptions have even happened to practitioners of much experience and observation: It is reported of the most celebrated lithotomist of this, or perhaps any other country, that in the course of his practice, which indeed was very extensive, three patients were cut by him in whom no stones were discovered, and where a schirrous or hardened state of the bladder had given rise to the mistake*. With practitioners of experience, however, this can never happen but from gross inattention; for I will venture to affirm, that a person accustomed to the

* The late Mr Cheselden.

sensation communicated by a stone, can never, if he attends properly to what he is doing, be deceived by the application of the sound to a schirrus or any other tumor.

There being the least hazard, however, of such a misfortune as the one I have mentioned, namely that of a patient being made to undergo all the pain and risk of the operation of lithotomy, when no stone has existed, is a point of such a serious nature, and fraught with such consequences, both to the patient, practitioner, and art of surgery, as ought to excite the most accurate attention to this part of the operation.

SECTION III.

General Remarks on the Operation of Lithotomy.

THE presence of a stone in the bladder being ascertained in the manner I have mentioned, the means to be employed for the relief of the patient, is the next object of consideration.

At different periods, the public have been amused with encomiums on the lithontriptic powers of different articles, particularly of lime-water, and of caustic alkali in a diluted state, and more lately of aerated alkaline water. But although some human calculi are soluble in all of these liquids, yet none of them can be conveyed in such a state to the bladder as to be much depended on. Many indeed have obtained relief from the use

of these remedies: The pain has, by their means, been rendered less severe, and the paroxysms have been rendered less frequent; but we have not one authenticated instance of a stone in the bladder being dissolved by the use of these, or any other remedy.

As the constituent principles of these and other lithontriptic medicines, render them liable to very material changes in their circulation from the stomach to the bladder, it has been proposed to convey remedies of this class directly into the bladder itself, in order to bring them into immediate contact with the stone; and machines have, accordingly, been invented for injecting with facility such medicines of this kind as are supposed to prove most effectual: But, after a great many trials have been made of remedies of this class, it seems now to be universally admitted, that no solvent, powerful enough to have any effect upon a stone, can be injected into the bladder, but with the greatest hazard of injuring that organ.

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But as some practitioners still continue to think favourably of it, I have given a delineation, in Plate LXXIV. fig. 1. of a machine by which liquids may with ease be thrown into the bladder. Every attempt, however, of this kind is now in general laid aside; and as no dependence is to be placed upon the lithontriptic powers of any medicine taken by the mouth, the only resource we have is, the removal of the stone by a surgical operation. In this manner, if his constitution is sound, the patient may again enjoy as good health as he did before he was attacked with the disease. And unless the operation is performed, the remainder of a miserable life will probably be cut short by the frequent returns of pain and fever, to which people in this situation are constantly liable.

We ought, however, to remember, that although a great proportion of those who are cut for the stone recover and do well, yet a considerable degree of danger always attends the operation; so that, before

fore advising any person to submit to it, such circumstances ought to be considered with attention, as can best enable us to form a just prognosis of the event.

By experience it is found, that children more readily recover from this operation than adults; and it is likewise observed, that old people, from the fifty-fifth to the seventieth year, whose constitutions are not impaired, run less risk from it than men in the full vigour of life. This may possibly arise from the inflammatory symptoms, which usually succeed to this operation, being more apt to proceed to a dangerous height in young plethoric people than in older patients; and we know from experience, that more danger is to be dreaded from the inflammation that this operation is apt to excite, than from any other cause. But at whatever period of life the patient may be, if he is otherwise healthy, more success is to be expected from the operation, than if his constitution had been previously impaired by frequent returns of the disease; and this especially

especially when it has continued so long as to produce ulceration in any part of the bladder.

In an ulcerated state of the bladder, if the patient is advanced in years, he could not expect much enjoyment of life, even although he should recover from the operation: In this situation, therefore, a prudent practitioner would rather decline to operate: Instead of this, he would rather advise a plentiful use of mucilaginous drinks; an occasional use of the warm bath; together with doses of opiates proportioned to the degree of pain. By these means the violence of the pain is sometimes mitigated, and the patient is thereby saved from the distress of a severe operation, the effects of which, in a constitution such as I have mentioned, very frequently prove fatal.

But even in these circumstances, if the patient is at an early period of life; if he is suffering much from the disease; and if he is not so weak as to make it probable that the quantity of blood usually
lost

lost in the operation may irreparably injure his health ; I would decidedly advise the operation. His chance of recovery will, undoubtedly, be less than if his health had otherwise been unimpaired ; but, if he is lucky enough to survive the operation, he may enjoy life with comfort and ease.

When the operation of extracting the stone is resolved on, the next point to be determined is the best method of doing it. From the anatomical description that I have given of the parts with which the human bladder is surrounded, it appears, that there are only two points at which it can with propriety be laid open. A considerable part of the fundus of the bladder we have shown to be covered with the peritonæum ; so that to open it here would be attended with imminent danger, from the certainty of exposing the abdominal viscera, not only to the effects of the atmosphere, but to the irritation of the urine finding access to the cavity of the peritonæum by the wound
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in the bladder. The posterior part of the bladder I have shown to be either immediately covered with bone, or internally connected with parts which it would be highly improper to injure ; and these particularly are, the rectum ; the vesiculæ seminales ; and the vasa deferentia and ureters.

The only parts of the bladder, therefore, which can with propriety be cut into, are, that portion of the anterior part of it, lying immediately below the peritonæum, and which, when in a state of distention, is raised somewhat above the pubes ; where an incision directly above the brim of the pelvis will lay that part of it bare where it is not covered with the peritonæum, and where accordingly an opening into it may be made : And, again, that portion of the bladder that we term its neck, which may be opened laterally by an incision in the perinæum, without any danger of wounding other parts of importance.

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It is in one or other of these parts that any opening into the bladder can be made with safety. Some practitioners, indeed, have attempted to cut into it at the posterior part of its neck, or even into the body of it at once; but the hazard of wounding parts of much importance is here so great, that for this and other reasons to be mentioned hereafter, every operation of this kind is now laid aside. We shall presently, however, enter more fully into the discussion of this point, by giving a detail of the various means that have been proposed, from the time of Celsus downwards, for the purpose of extracting stones from the bladder; and this I shall do in the order of time these different operations were introduced into practice.

The distress and misery that urinary calculi excite were probably experienced in the earliest ages of the world. Relief, we may therefore suppose, would be sought for, by the removal of the stones, as soon as such a knowledge of anatomy

was obtained as could justify the attempt. We find accordingly, from the writings of Hippocrates, that even at this early period, the operation for the stone was frequently performed ; but as this branch of business was then solely practised by a particular set of men termed Lithotomists, we have received no account from this author of their method of doing it. Celsus is the first who describes the method of operating at the time when he lived ; and it was done by making an opening in the body of the bladder, directly upon the stone itself. From the small number of instruments used in this method of cutting, it has been termed the operation by the Lesser Apparatus.

SECTION IV.

Of the Operation of Lithotomy by the Lesser Apparatus.

THE person to be cut being properly secured, the easiest and best method of effecting which I shall describe in Section VII. the surgeon must dip the fore and middle fingers of his left hand in oil; and having introduced them into the rectum of the patient, he is to search for the stone, and push it forward towards the perinæum, so that it may be felt between the scrotum and anus. In order to facilitate this part of the operation, and to get the stone properly fixed, either the surgeon or an assistant should press with his right hand upon the under part of the abdomen, at the
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same time that the surgeon himself is pushing the stone forward with his fingers in the rectum. In this manner the stone is to be pressed forward below the pubes, and secured upon one side of the perinæum, between these bones and the anus. This being done, we are directed by Celsus to make a semilunar cut through the skin, cellular substance, and muscles; beginning on one side of the anus, and carrying the cut directly over the centre of the tumor formed by the projection of the stone. The bladder being thus laid bare, a transverse incision is made through the coats of it directly upon the stone; when the stone, if it is small, may probably be turned out by pressure from behind with the fingers in the rectum; but if it is large, and does not come away easily, we are desired by Celsus to take the assistance of a hook for scooping it out.

This operation, with a few variations, continued, so far as we know, to be the only method of cutting for the stone, till the beginning of the fifteenth century,

when another method of operating, to be hereafter described, was very generally adopted. Long after this period, however, this operation of Celsus was still continued by many individuals; and the ease with which it is accomplished, not only from the small number of instruments with which it is done, but from little or no anatomical knowledge being requisite, preserved it in constant use with Itinerants, who continued, even to a late period, to practise it in different parts of Europe, under the name of the Operation upon the Gripe.

This method of cutting for the stone is indeed so easily performed, particularly in early infancy, that, even in these times, many of our well informed practitioners have a strong partiality towards it. At so late a period as the time of Heister, we find it was much in repute, insomuch that Heister himself performed it frequently. But a wrong representation has commonly been given of the parts injured in this operation. For it has been commonly
supposed,

supposed, that by cutting directly upon the stone, the bladder itself must alone be wounded, while all the neighbouring parts of importance are imagined to escape unhurt; a circumstance that would recommend it strongly, if, on experience, it was found to be the case. This, however, is far from being so; as all who will make the experiment, will readily perceive.

A strict attention to the anatomy of the parts, might at once indeed convince us of the difficulty, if not of the absolute impossibility of cutting from the perinæum directly upon a stone in the bladder, without destroying either the vasa deferentia, vesiculæ seminales, or excretory ducts of those receptacles; the destruction of any of which would produce the usual effects of castration with as much certainty as a total extirpation of the testes themselves. These parts are all placed upon the under and back part of the bladder; and as they, as well as the ureters, are immediately connected with

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that

that part of the bladder that is cut in this operation, it is perhaps impossible to perform it without dividing one or all of them.

As I had once a favourable opinion of this operation, I thought that in some instances it might be usefully employed, if, on experience, it should appear that these parts could be avoided with the scalpel. I accordingly put it frequently in practice on dead subjects; but although in all of them it was done with every possible attention, it was constantly found either that the vesiculæ feminales were divided, or that their excretory ducts were cut across. This, however, was not all; for although in some instances the urethra was not touched, yet in others it was found to be completely laid open before the scalpel reached the bladder. In every instance where the operation is performed in the manner directed by Celsus, the urethra must necessarily be cut, before the instrument reaches the bladder. For it is altogether impossible to make a
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transverse

transverse incision into the bladder, in the manner advised by that author, without previously passing through part of the urethra; the farthest extremity of that canal being always pushed forward by the fingers in the rectum, in such a manner as to render it impossible to avoid it in this method of performing the operation.

But in most of the trials that I made upon dead subjects, for this purpose, I attempted what I consider as a very material improvement of Celsus's method. A transverse or semilunar incision through the teguments and muscles, I believe to be better adapted than any other, for giving a free passage to the stone; but as the bladder is composed of a very dilatable membranous substance, there is no necessity for a transverse cut being made in it. After laying the bladder bare, therefore, by a semicircular cut along the course of the stone, instead of continuing the same kind of incision with which the operation commenced, a longitudinal wound was made directly on the centre

of the stone, in order to avoid with as much certainty as possible all those parts that should not be injured. Even with this precaution, however, although the urethra was avoided, some of the other parts I have mentioned were always divided; so that although they may by accident, perhaps, be avoided once in a great number of times, I am confident that even the most expert anatomist would seldom be able to make an opening into this part of the bladder, sufficient for extracting a stone of a moderate size, without dividing either the vesiculæ feminales, the vasa deferentia, or their excretory ducts. In some instances, too, the entrance of the ureters into the bladder is so low down, as to render them liable to be injured by this operation. This, however, is a rare occurrence; but it has in some instances happened.

Another important objection to this operation is, that the bladder being pushed forward, and divided at a part that must afterwards recede from the wound in the teguments,

teguments, much risk must be thereby incurred of the formation of sinuses, by the urine insinuating into the neighbouring parts; and we have to add to this, that in general this operation must be confined to the early periods of infancy. The readings of Celsus with which we are furnished, limit the performance of this operation to the age of ten, or from that to the fourteenth year; but this must surely be considered as an error in the late editions of that work, as this mode of operating is unquestionably better adapted for the earliest periods of infancy, than for the more advanced stages of it, inasmuch that it may always be done with more or less ease, in proportion to the thickness of parts about the rectum and bladder; and this, again, depends in a great measure on the age of the patient. We are told, indeed, of some practitioners who performed this operation on people of every age, of every habit of body, and whether corpulent or not.

Such accounts, however, have never appeared to be authentic.

Among other improvements of this operation of Celsus, the use of forceps for extracting the stone, was perhaps the greatest; but neither this, nor any other advantage it can receive, is capable of obviating the difficulties I have mentioned. We find accordingly, that, about the beginning of the 16th century, some time between the year 1500 and 1520, a new method of operating for the stone was proposed at Rome, by Johannes de Romanis, as we are afterwards informed by one of his pupils, Marianus, and whose name has been commonly given to it; this being termed the *Methodus Mariana*, or *Lithotomy* by the greater Apparatus, from the great number of instruments that at first were employed in it.

SECTION V.

Of Lithotomy by the Greater Apparatus.

BY this operation a passage is made into the bladder, by cutting into the urethra at the bulb; and at this opening a variety of instruments were introduced, for the purpose of dilating the passage to such a size as might easily admit of the extraction of the stone.

For a considerable time after this operation was proposed, a number of inventions were brought forth, for the sole purpose of rendering the dilatation of the urethra and adjacent parts more easy. These it is unnecessary to enumerate, as an account of the operation, as it was last practised in its most improved state, will serve to

to communicate all that is necessary to be known concerning it.

The patient being secured, and placed upon a table in the manner to be described more particularly in Section VII. a grooved staff was then passed through the urethra into the bladder; the handle of the instrument being carried over the right groin, while its convex part was made to push out the urethra on the left side of the perinæum. In this position the staff was preserved by an assistant, who likewise suspended the scrotum; while the operator, with a scalpel in his right hand, made an incision from the very bottom of the scrotum to within a finger's breadth of the anus, carrying it all along the left-side of the perinæum, within a very little of the rapha.

The skin, cellular substance, and muscles, being thus divided, the urethra itself was now opened at its bulb, by cutting directly into the groove of the staff; and the incision was completed by carrying the knife along to the extremity of

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the urethra, at the commencement of the prostate gland.

Various instruments were at one period in use, termed Dilators, and Male and Female Conductors, for the purpose of finishing the operation, by dilating such parts as were not cut; and the timidity of some operators was such, that they dilated, stretched, or lacerated almost all that part of the urethra that lies between the bulb and prostate gland; a degree of caution by no means necessary, and which, by the violence which this dilatation did to the parts, was sure to produce very distressful consequences. Other practitioners, however, performing the operation so far in the same manner, finished the other parts of it in a different way. They first introduced a blunt gorget into the bladder, by running its beak along the groove of the staff, and pushing it forward, so as to force a passage through the prostate gland; and this being done, the forefinger of the left-hand was pushed along the gorget, and with it the passage was farther

farther dilated, till the opening was supposed to be sufficiently large for the stone to pass through it.

The opening into the bladder being in this manner completed, the stone was extracted in the manner I shall afterwards direct, when treating of the lateral operation, in Section VII. by the use of different forceps adapted to the size of the parts: And in the extraction of the stone, all those parts that were not cut in the previous steps of the operation, were of necessity greatly lacerated.

Although this operation was long practised, it is liable to many objections. Of these the number of instruments used in it, is mentioned as one: But, in the improved state of the operation, that I have described, this objection is entirely removed, no more instruments being used in it than are daily employed in the most simple method of performing the lateral operation; namely, a scalpel, gorget, and forceps for extracting the stone. But the material objections to which it is liable, are,

are, that by beginning the incision too near to the scrotum, much more of the urethra is cut than is necessary : By not dividing the prostate gland with the scalpel, the parts are so much lacerated, first by the forcible introduction of the blunt gorget, and then by the extraction of the stone, as must be the cause of much irreparable mischief : And lastly, by the parts not being freely divided, we might frequently find it impossible to extract large stones by this operation, which, in the lateral method now practised, might pass with ease. In other respects, however, this operation possessed much merit, and it required only to be improved in a few circumstances, to become the real lateral operation of modern practitioners. These, however, it is unnecessary to enlarge upon here, as they will be afterwards particularly pointed out in the description to be given of the lateral operation.

After this operation had been practised for thirty or forty years, some of the inconveniencies that result from it suggested the

the idea of what was afterwards termed the High Operation; an appellation it received from the bladder being cut into above the ossa pubis.

About the year 1561, Franco, a French surgeon of this name, published a treatise on herniæ *; and here we find the first account of the high operation. It was first suggested to Franco by accident; for having, as he informs us, met with a large stone in a child two years of age, which he could not possibly extract by the operation then practised in the perinæum, he was induced to open the bladder above the pubes: But although the stone was extracted and the child recovered, Franco never performed the operation again; and he even advises it not to be attempted by others, from the great danger which he thinks will attend it.

The next account we find of it is by Rossset, in a publication on this and other subjects, published at Paris in the year 1590. But it does not appear that he
ever

* *Traité tres ample des Hernies, par Pierre Franco.*

ever performed the operation himself; nor was it any where much practised till some time after the commencement of the present century, when it was adopted and keenly patronised at London by Mr Chesselden and Mr Douglas.

During the twelve or fifteen years immediately subsequent to the year 1720, the high operation was frequently performed both in London, Edinburgh, and other parts of Europe; but the lateral operation, with the improvements upon it by Rau, being then more generally known, the superior advantages it was found to possess very quickly procured it a preference; and since this period the high operation has never been generally practised, either in this or any other country. But I shall now proceed to describe the method of doing it.

SECTION VI.

Of the High Operation for the Stone.

I Have already made it appear that the fundus of the bladder, or that part of it lying highest in the pelvis, is covered with the peritonæum ; so that at this part no opening, it is evident, can be made in it with safety, as the operator would not only incur the risk of wounding the intestines, but the urine would be apt to escape into the abdomen. It is the anterior part of the bladder, namely, that part of it that lies between the middle of this viscus and its neck, that ought to be opened in this operation : But this part of the bladder is seldom sufficiently elevated for this purpose, and as one common effect of the stone in the bladder is

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to induce a diminished or contracted state of it, this circumstance of itself is a very important objection to this operation; for unless the bladder can contain a large quantity, at least a pound and a half in an adult, it ought not to be attempted.

Various methods have been proposed for distending the bladder. Some have said that it may be done by throwing air into it with bellows; and others have advised a quantity of water to be injected immediately before the operation, and to retain it by forming a ligature upon the penis. Both of these methods, however, are apt to do harm by distending the bladder too suddenly; and we are even told by some, that it has been purst by this kind of treatment. Means, therefore, of a more harmless nature should be attempted; and it may be done, I think, without running any risk of hurting the bladder, merely by the patient being accustomed for a considerable time before the operation, to retain his urine as long as possible; and as soon as it is found that

he can retain a sufficient quantity, by passing a ligature upon the penis ten or twelve hours before the operation, and causing him drink plentifully of any diluent drink, we may be almost certain of producing an easy and sufficient degree of distention.

This being done, the patient must be laid upon a firm table about three feet four inches in height ; at the same time, that his legs and arms should be secured, not with ligatures, but with the hands of assistants. In order to guard as much as possible against any injury being done to the bowels, the patient should be laid with his head considerably lower than his body, and his thighs and buttocks raised. By this situation, too, the stone, which would otherwise fall into the neck of the bladder, where it could not be very accessible, is brought more contiguous to the intended opening, and is thereby more easily laid hold of, either with forceps or the fingers.

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The patient being thus properly secured, an incision is to be made with a round-edged scalpel, directly upon one side of the linea alba, beginning about four inches above the ossa pubis, and ending at the symphysis of these bones: Even the linea alba itself may be cut with safety; but it is better to avoid it, as the incision is more easily made in soft parts than in tendons or ligaments. The skin and cellular substance being freely divided, the recti and pyramidales muscles come successively into view: In general, the incision may be carried on merely by separating these muscles from one another; but no harm could be done by some of their fibres being cut.

A sufficient opening of the external parts being in this manner obtained, the operator should now search with his fingers for the bladder, which he will commonly discover immediately above the pubes. With the fingers of his left-hand he should now press back the peritonæum, with the intestines contained in it, and

with the same scalpel with which he performed the preceding steps of the operation, he should penetrate the bladder itself in its most prominent part. This opening into the bladder should at once be made so large as to admit two of the fingers of the operator's left hand; which being introduced, the incision should be enlarged to the length of three inches, by running a probe-pointed bistoury along one of the fingers, down towards one side of the neck of the bladder. The instant that the fingers are introduced into the bladder, the ligature upon the penis should be taken off, so that the water contained in it may be discharged by the urethra, otherwise the whole will be discharged by the wound, and part of it might lodge among the contiguous muscles.

The incision being in this manner completed, the operator ought to search with his fingers for the stone, and if possible, it should be extracted without the assistance of any instrument: But if this does not succeed, forceps must, no doubt, be employed.

ployed. One great advantage that we derive from this operation is, that as the extraction of the stone does not require much force, so it is here rarely known to break: But when this misfortune takes place, the pieces will be more easily removed with the fingers alone, than with any of the scoops commonly employed. The stones being removed, the upper part of the wound in the teguments should be drawn together, either with strong adhesive plasters, or with the twisted future, care being taken to leave at least an inch and a half in the under part of it open, in order to discharge any urine that may be thrown out from the wound in the bladder into the contiguous parts. It might even be proper to keep the whole external incision open till the wound in the bladder is reunited; but as the bowels, supported now by the peritonæum only, would be apt to protrude at this opening, and as this would prove not only troublesome but highly dangerous, it ought by all means to be guarded against.

With this view the bowels should be kept open with gentle laxatives, and the patient during the whole course of the cure should be kept with his head and upper part of the body low, and the pelvis elevated.

The parts injured in this operation are not any where nearly surrounded with bone; so that large stones can be extracted with more ease in this than in any other way: And as the wound in the bladder is made far from its neck, fistulous openings are not so apt to ensue from it as from incisions in the perinæum. These are two advantages that we derive from this operation; but the objections to it are various.

1. When it is found that the bladder does not admit of such distention as to be raised above the pubes, it is almost impossible to make an opening into it without dividing the peritonæum. From this much danger would undoubtedly ensue; air would find access to the whole surface of the alimentary canal; the
bowels

bowels would protrude, and urine would escape into the cavity of the abdomen.

Many indeed assert that no danger ensues from the protrusion of the bowels; that the wounds heal with the same ease, and that the patients recover equally well as if this did not happen: No practitioner however in these times will give credit to this, and it is accordingly a very important objection to the high operation

2. As the urine is apt to find access between the peritonæum and abdominal muscles as well as between the bladder and pubes, troublesome sinuses are apt to form in the cellular substance of these parts, and as no vent can be made for the matter, they always terminate in much distress.

3. It has been observed, when the habit of body is not entirely good, that a cure cannot be obtained either of the wound in the bladder, or external teguments. This, it will be said, may be alleged as an objection to every important

I 4 operation;

operation ; but it has been completely established by observation, that degrees of disease in the constitution prove highly detrimental in the high operation for the stone, which in the usual method of operating in the perinæum give no cause of alarm.

4. This operation is confined almost entirely to patients under thirty years of age : For although it was at one period frequently practised on older people, and although no particular reason can be given why it ought not to succeed in more advanced ages, yet we learn from almost every author who has written upon it, particularly from Middleton, Smith, Douglas, and Heister, that a very small proportion only recover of such as have passed their thirtieth year.

It is perhaps for one or other of these reasons that the high operation has fallen into disuse, and that it has not been much practised for a great length of time in almost any part of Europe. But although this method of operating is attended

tended with hazard, and is frequently followed with distressful consequences, yet there is reason to think, that, in particular circumstances, it might be practised with advantage.

The most material objection, to the modern or lateral method of performing this operation, arises from the bruising of the soft parts against the contiguous bones in the extraction of a large stone; which is so much the case, that we may consider the risk in that operation to be almost in proportion to the size of the stone. When a stone is small and easily extracted, the proportion of deaths in the lateral operation is exceedingly small: But whenever the stone is of such a size as to weigh seven, eight or ten ounces, it is perhaps one of the most dangerous operations to which a patient can submit. In different instances too, the stone has been so large, that it could not be taken out by the lateral operation; nay, some cases are on record in which it became necessary to perform the high operation, after the operator

operator had failed in extracting the stone by the usual method of cutting in the perinæum*.

When, therefore, from the long continuance of the disease; from the sense of weight about the neck of the bladder; and particularly from the touch by the finger in ano, we have reason to suspect the stone to be large, it ought to be an object of consideration, how far it may be proper to avoid the lateral, and in certain circumstances, to employ the high operation. The circumstances to which I allude respect the age of the patient, the soundness of his constitution, and the possibility of distending the bladder so as to raise it above the brim of the pelvis. These circumstances are favourable where the stone is large; and when it is known to be so, the high operation, although less advantageous in the general run of calculous cases than the lateral method of cutting,

* We find that it happened to Heister. Vid. Heister's Surgery, p. 2, Sect. V. Chap. CXLII.

ting, may be practised with a greater probability of success than any other with which we are acquainted.

Having now said all that is necessary respecting the Apparatus Altus, we shall proceed to the consideration of what has usually been termed the Lateral Operation.

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SECTION VII.

Of the Lateral Operation.

IN the operation of lithotomy, as it was formerly practised by the great apparatus, the external incision was made in nearly the same part that it is now in the lateral operation; but the two methods of operating are materially different in every other circumstance.

The original invention of the lateral operation is due to a French Ecclesiastic, commonly known by the name of Frere Jacques. This operator first appeared at Paris in the year 1697, when, by the successful event of a few cases, he was desired to operate upon a great number. But it soon appeared to practitioners of discernment, that the same he had acquired

quired would not probably be of long duration. For with a very imperfect knowledge of the anatomy of the parts concerned in the operation, a bad assortment of instruments, and a total neglect of his patients after the operation, it was scarcely possible that much success could result from his method. His manner of operating was as follows :

The patient being properly secured, either upon a table or on a bed, a common solid staff was introduced into the bladder by the urethra, and the handle of it being carried over the right groin, the convex part of it was made to elevate the teguments and other parts on the left side of the perinæum.

With a straight bistoury he now made an incision through the skin and cellular substance, beginning between the anus and tuberosity of the ischium, and proceeded upwards along the left side of the perinæum, at a small distance from the rapha, till it extended at least one half of the course of the perinæum. With the
same

same knife he now went on along the direction of the staff, to divide the parts between the external incision and the bladder, which he also opened with the point of this very knife with which the other steps of the operation had been done. At this opening in the bladder he first introduced the index of his left hand, in order to discover the situation of the stone; and having withdrawn the staff, he laid hold of the stone with a pair of forceps, and performed the extraction in the usual manner. The patient was now carried to bed, and no farther attention was paid to him by the operator, who never applied any dressings, as he trusted the subsequent management of every case to the nurse or other attendants.

In consequence of this unpardonable neglect, and by frequently cutting parts in the course of the operation which he ought to have avoided, a great proportion of those on whom he operated died; no less, we are informed, than twenty-five
of

of sixty *. Hence Jacques soon fell into disrepute ; and although he afterwards made many improvements in his method of operating, particularly in using a grooved staff instead of a solid one, and in being more attentive to the subsequent management of his patients, yet his reputation in Paris never again gained ground ; nor do we find that his method was ever attended with much success, either in Holland, or in the various parts of Germany where he afterwards practised.

For with so much inattention did he proceed, that although he professed to cut directly into the body of the bladder, without injuring either the urethra or prostate gland ; yet in the dissection of such bodies as died of the operation, it was found that in many the prostate gland was divided, together with the vesiculæ seminales. In some instances, the bladder was cut in two or three different parts ; in others the rectum was divided ; and it
even

* Vide Morand Opusculæ de Chirurgie, part ii. p. 54.

even frequently happened that the bladder was entirely separated from the urethra*. We need not wonder, therefore, that this practitioner, as well as his method of operating, soon fell into discredit. But although this was a consequence that necessarily ensued from the ill success that attended his practice; yet the world, we must admit, is much indebted to Jacques, for having laid the foundation of the lateral method of cutting for the stone, which, in its present improved state, is practised with so much success over all Europe.

The famous Rau was the first who endeavoured to improve this operation of Frere Jacques, which he did by using a staff with a deep groove, by which he was enabled to continue the incision into the bladder with more certainty than when a staff entirely solid was employed. But Rau, afraid of wounding the prostate gland,

* For a particular account of Frere Jacques's method of operating, see Dr Lister's *Journey to Paris*; the works of Dionis, Meri, Collet, Saviard, and Morand.

gland, introduced a refinement into his method of cutting, which, in the event, proved extremely hurtful, and was probably the cause of its being afterwards laid aside. For, instead of dividing the urethra and prostate gland, by which the extraction of the stone would have been made easy, he dissected with much caution by the side of the prostate, till the convex extremity of the staff was discovered in the bladder itself. At this part an incision was made into it, and the stone was afterwards extracted, in the manner then practised for cutting with the great apparatus.

-By this method of operating, the rectum and vesiculæ feminales were in great danger of being injured; the stone was extracted with difficulty; and from the depth of the incision, the urine did not pass easily off by the wound, so that troublesome sinuses very frequently ensued*.

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* Räu himself kept this method of operating, as much concealed as possible. But an account of it was published after

These inconveniencies prevented this operation of Rau from ever being generally received, and suggested to our countryman, the celebrated Cheselden, the lateral method of cutting, as it is now, with a few alterations, very universally practised.

As this operation of Mr Cheselden is described by many writers in Surgery, it is not here necessary to enter into a detail of it: I shall now therefore proceed to describe the lateral operation in its present improved state.

That the patient may not find it necessary to go soon to stool after the operation, several stools should be procured by a purgative on the preceding day; and with a view to discharge the contents of the rectum more entirely, an injection should be given a few hours before the operation is performed.

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after his death by Albinus; who, by assisting frequently at his operations, became perfectly master of the manner of performing it. *Vide* Index suppellectilis anatomicæ, &c. Lug. Batavorum.

When the bladder is in a collapsed state, it is liable in this operation to be cut in different parts; the patient ought therefore to be desired to drink plentifully of some diluent liquor, and to retain his urine for several hours before being laid upon the table: In some, however, the irritation produced by the disease is in such a degree as entirely to prevent this voluntary retention of urine; in which case the penis should be slightly compressed with a broad fillet for some hours before the operation; and we lessen or remove the irritation by a large dose of opium.

These circumstances being adjusted, and the perinæum and parts about the anus being shaved, the patient is now to be laid upon a table for the operation: The most convenient height for this table is three feet two inches. It ought to be perfectly firm: And, that there may be sufficient space for the patient, it should be about three feet eight inches long, and two feet and a half wide.

The patient should be completely and properly secured, and the following is perhaps the best method of doing it: Let a noose be formed in the double of a piece of broad firm tape, five feet in length: the patient's wrists being passed through this noose, he should be desired to take a firm hold of the outside of the ankle of the same side, when, by different turns of the tape round the hand, ankle, and foot, his hand is to be firmly secured in this position; and this being done on one side, the hand and foot of the opposite side are in like manner to be firmly tied together.

The operator should now introduce a grooved staff, of a size proportioned to the parts through which it is to pass. Different sizes of these staffs are represented in Plate LXIX: The artist who makes them should round off the edges of the grooves, otherwise they are apt to injure the urethra; and the extremity of the groove should be perfectly free and open, otherwise it is difficult to disengage
the

the gorget after it has passed into the bladder. As the groove is only necessary in the convex part of the staff, and from that to its point, the handle of the instrument, down to the commencement of the convexity, should be entirely solid, so as to admit of the penis being pressed upon it, without being hurt either by the hand of the assistant, or by a piece of tape, which may be sometimes necessary, as I have already advised, for preventing the urine from being discharged.

I may here remark, that more attention should be given to the length of the staff than is commonly done. Staffs are in general too short; so that when in the course of the operation, the handle is pressed down upon the groin by the assistant, the point is very apt to slip entirely out of the bladder; a circumstance to be guarded against with all possible attention, and this cannot with such certainty be done as by making the staff always of a sufficient length.

The stone being again distinctly felt, not only by the surgeon himself, but by his assistants, the patient must now be put into that posture in which he is to be kept during the remainder of the operation. The table intended to be used should be perfectly level; but, that the patient may lie upon it with as much ease as possible, a pillow may be put under his head, and, that the pelvis may be higher than the abdomen, there should be at least two pillows under his buttocks, which should be made to project an inch or two over the end of the table.

A due elevation of the buttocks, is highly important, although seldom attended to by the operator; indeed, the very reverse is often advised, the head and upper part of the body being generally kept higher than the pelvis. This, however, can arise from inattention only; for we may by the least reflection be convinced, that the more erect the body is kept, the greater will be the pressure of the intestines upon the bladder; and

if by this pressure the fundus of the bladder is forced down upon its neck, the risk of its being wounded must be great indeed.

Of such patients as have died of this operation, I have, in different instances, found on dissection, that the bladder was wounded in three different parts: In its cervix, as is always the case when the gorget is of a proper length; in its side considerably above the cervix; and, again, in the fundus or upper part of it. Now this can never happen, if the directions I have given are kept in view; for when the bowels are prevented from falling upon the bladder, by the buttocks being raised above the rest of the body, and if at the same time the bladder is properly distended with urine, it must be altogether impossible, in the usual lateral operation, to injure it in an improper part. But if this precaution of having the bladder distended during the operation is neglected, at the same time that the bowels, by an elevated posture of the up-

per part of the body, are allowed to fall into the pelvis, the bladder must be so completely collapsed, and its fundus pushed so much down upon its neck, as must frequently be the cause of much unnecessary hazard.

Besides the cases to which I allude, in which the bladder was after death found to be wounded in different parts, we find a very candid acknowledgment made by a celebrated lithotomist, of his being once so unfortunate in the lateral operation, that a considerable portion of the small guts passed immediately out at the wound *.

This would certainly have disconcerted many operators: But, fortunately for the patient, the operation was in this case completely finished; the bowels were reduced and a perfect cure was obtained. Mr Bromfield endeavours to account for this protrusion of the bowels in a different manner; but I am much inclined to believe,

* *Vid.* Mr Bromfield's *Chirurgical Observations and Cases*, vol. II. p. 264.

believe, that it happened from the pelvis not having been sufficiently raised above the rest of the body, and to the bladder having been in a collapsed state at the time the incision was made in it. For this author, it must be remarked, instead of ordering the bladder to be distended at the time of operating, desires expressly that it may be emptied immediately before the operation *.

Matters being adjusted in the manner I have directed with respect to the patient, an assistant on each side is to secure his legs and arms; one must prevent him from moving the upper part of his body; another must lay hold of the staff; and a fifth is required to hand the necessary instruments to the operator.

The surgeon, after having again felt the stone with the staff, is now to make the hand of it pass over the right groin of the patient, so that the convex part of it may be distinguished on the left side of the perinæum: In this position it must
be

* Page 228, Vol. II.

be exactly preserved by the assistant, who with his right hand should lay hold of the handle of the staff, while with his left he elevates and supports the scrotum.

The thighs of the patient being sufficiently separated by the assistants, and the surgeon being seated between the patient and the window, in such a manner that the light may fall directly upon the perinæum, an incision is now to be made with a common round-edged scalpel through the skin and cellular substance, at least four inches in length in a full-grown person, and so in proportion in smaller-sized people; beginning a little to the left-side of the rapha, nearly an inch below the termination of the scrotum, and proceeding along the same side of the perinæum, till it runs at an equal distance between the tuberosity of the ischium and the anus, which last it ought to pass at least an inch.

As the success of the operation depends in a great measure on this part of it being properly performed, it ought at all times

times to be done with the utmost attention. From timidity or inattention, this external incision is commonly made too short: Instead of four inches, I have often seen it, even in the largest adult, scarcely two. In consequence of this, the muscles, and other parts below, are not properly divided; the operator has not freedom to prosecute the other steps of the operation; and if the stone is large, the parts through which it has to pass must be much more bruised and lacerated than if they had been freely cut with the knife; and as no harm can ensue from the external incision being free and ample, it ought in every instance to be so. Much hazard may ensue from the division of the teguments and muscles being small; but none from their being largely laid open.

By this first stroke of the scalpel, the skin and cellular substance should be freely divided, so as to bring the subjacent muscles completely into view; when, by a continuation of the incision, the erector penis,

penis, accelerator urinæ, transversalis perinæi and levator ani should be cut*.

As

* Soon after the first edition of this work was published, my friend Dr Monro, in conversing on the lateral operation of Lithotomy, observed, that I had desired muscles to be cut which might be avoided; and knowing that Sharpe, Camper, and others who wrote upon this operation, soon after that important improvement was introduced, of cutting the prostate gland with the gorget of Hawken's, instead of the scalpel, were of opinion, that the extensive division that I have advised of these parts was unnecessary, I shall here shortly mention the reasons that have made me differ from authorities of such respectability.

That this operation may be performed without dividing more muscles than the transversalis perinæi and levator ani, is well known; but it is not what may be done, but what ought to be done that in all important operations demand our attention: On the point in question, my opinion has always been, that all those muscles should be cut that are apt to be bruised or torn in extracting the stone: Now this is so clearly the case with the erector penis and accelerator urinæ, that few will doubt of the propriety of dividing them who have inspected them in patients dying after the extraction of large stones: Whenever a stone has been large and difficult to extract, I have always found these muscles much contused, often lacerated, and commonly in a state of mortification. Whereas, when completely cut across, this does not so readily happen; the
divided

As no danger ensues therefore from a free division of these parts, and as a large opening

divided ends of the muscles retract; they are thereby saved from the violent pressure of the forceps and stone; and the operation is finished with much more ease than it otherwise possibly could be.

Having long observed this to be the case; knowing that no danger could ensue from dividing them, for it is daily done with impunity to a much greater extent in fistulous or sinuous ulcers of these parts, and finding upon trial that the more freely they were cut the more successful the operation commonly proved, I have therefore long been in the practice of doing it: My operations indeed have proved successful nearly in proportion to the freedom with which these parts have been divided, at the same time that the wounds have healed more kindly than when small openings have been made.

Neither has this division of these parts any influence on the direction of the external cut, which ought to be in the line that I have mentioned, beginning nearly an inch below the termination of the scrotum, a very little to the left of the *Rapha*, and proceeding obliquely along the same side of the perinæum, till it runs at an equal distance between the tuberosity of the ischium and the anus.

If the skin and cellular substance have been freely divided, they retract so much, that all the muscles that I have mentioned may be cut with ease: This indeed is not often done; by which, stones even of no great bulk are extracted with difficulty to the operator, and with

opening not only facilitates the extraction of the stone, but admits of any blood-vessel that is cut being easily secured with a ligature, which can never be done when the incision is small, it ought in every instance to be large. In general, the arteries with which these muscles are supplied are not so large as to render ligatures necessary; but whenever they prove to be so, and especially when the patient is weak and emaciated, the larger arteries should be immediately secured before the surgeon proceeds to the other steps of the operation.

In proceeding to finish the operation, surgeons not unfrequently open the urethra

with perfect torture to the patient; by which lives are often brought into hazard, and even lost, which otherwise might be saved.

I have insisted the more upon this, as I conceive it to be one of the most important points in this very interesting operation; one on which the success attending it must at all times in a great measure hinge; and particularly from my having witnessed more disastrous consequences from a timidity in regard to it, that is, from the muscles not being freely divided, than from all other failures on the part of the surgeon.

thra higher than it ought to be cut, and pass the knife into the substance of the bulb itself. But this adds greatly to the hazard of the operation: For, the blood-vessels of the bulb are not only large, but sinuses are much more apt to form in it than in other parts of the penis, by which the cure of the wound is rendered much more tedious when this part is divided; and not being necessary, it ought always to be avoided. When, therefore, the incision of the muscles is completed, the operator ought to search for the staff with the index of his left-hand; and having found it, he should now push the point of his finger along the course of it till he passes the bulb, when, with the edge of his knife turned towards the groove of the staff, he should divide the membranous part of the urethra in its whole course, from the bulb to the prostate gland; and as the finger is used as a director, and as by means of it the rectum is completely guarded, this incision of the urethra may be made with entire safety. There is in
general

general indeed such a quantity of cellular substance between the urethra and rectum, that in this part of the operation the gut cannot possibly be hurt, if the surgeon is not either very unsteady or inattentive: And by means of the precaution I have advised, of keeping the forefinger of the left-hand always between the knife and the intestine, it may in this manner be in every instance very certainly avoided.

The incision of the urethra being completed, the prostate gland, which we readily discover with the finger at the bottom of the wound, is next to be divided. In the hands of an expert surgeon, the operation might be finished with the same safety with the scalpel as with any other instrument: For, by continuing the incision of the urethra, and carrying on the scalpel so as to divide the prostate gland laterally, if the finger is still continued between the knife and the rectum, no risk could ensue from it: But as this part of the operation is performed entirely by feeling,

feeling, without the assistance of the eye-sight; and as many operators are not so much accustomed to this, as, in such circumstances, to be sufficiently steady, the rectum might be often injured were the scalpel to be commonly employed for completing the operation.

This inconvenience, however, of wounding the rectum, may with certainty be avoided by using a cutting director, or Gorget, as it is termed, instead of a scalpel: This alteration of the gorget was first proposed by Mr Hawkins of London: In Plate LXX. fig. 4. a view is given of this; and in the same Plate, and likewise in Plates LXXI. LXXII. and LXXIII. I have delineated different improvements that have been proposed upon this instrument of Mr Hawkins.

The gorget of Mr Hawkins is contracted too much at the cutting part of it, by which it does not divide the prostate gland sufficiently. Were we to use a gorget much wider in the cutting part of it, the division of the prostate gland might

indeed be made extensive enough ; but it is not done by the gorget in common use, so that the division of this gland is commonly too small, either for the extraction of a stone, or even for the introduction of the forceps, without much laceration ; a circumstance that in every instance should be guarded against.

The gorget in ordinary use, while it is too narrow in the cutting part of it, is too wide behind ; a form which the least reflection must shew to be not only unnecessary but hurtful ; for, after the division of the prostate gland, the only use of the gorget is to serve as a conductor to the forceps ; and as this purpose is answered equally well by a director that does not expand to near the extent of the gorget, it is obviously improper to have this instrument so wide as it is commonly made. But farther, the impropriety of this construction is still more evident, when we compare the size of the common gorget with the parts through which it has to pass :

pass: For it is obvious, that it must greatly injure the urethra; the back-part of the instrument being so wide and deep, as to render it impossible to pass it, without much laceration.

The cutting director, Plate LXXI. fig. 2. as well as the gorget, Plate LXX. fig. 2. will be found to possess all the advantages of the common gorget, without any of its inconveniencies: The cutting part of both expands more than that of the common gorget, so that they divide the prostate gland more freely; and as the blunt part of them is much contracted, they do not lacerate the urethra, on being pushed forward. To those who have never used these instruments, and who thereby may have a partiality for the common gorget, these instruments may perhaps appear not to be sufficiently wide for conducting the forceps: This, however, is not the case; and it will soon be found, that they are not only more easily introduced than the common gorget, but that they answer equal-

ly well for conducting either the finger or forceps.

It has been objected to these instruments, that they will not probably make such a free division of the muscles as is done by the common gorget. This observation, however, proceeds from prejudice in favour of an instrument with which practitioners are as yet better acquainted, and which has indeed been deservedly much employed; but it is thrown out without due reflection on its import. I have already endeavoured to inculcate the necessity of a free division of the teguments and muscles in this operation; but whoever considers this point with attention, will see, that this ought to be done with the scalpel alone, and that it should not depend in any degree upon the gorget: All that should be left for the gorget or cutting-director to do, is to divide the prostate gland with a small portion of the neck of the bladder. Some practitioners indeed have recommended instruments for carrying the incision in-

to the body of the bladder ; but this is a very hazardous attempt, and not in any respect necessary : For as soon as the prostate gland and neck of the bladder are divided, the forceps are passed with ease ; and the bladder itself is so easily dilated, that it readily yields to the passage of the stone, however large it may be. What I wish to have understood, is, that it is not the size of the wound in the bladder that renders the extraction of stones easy or difficult ; and that it is on the previous incision of the muscles and prostate gland that this almost entirely depends.

The membranous part of the urethra being divided by the scalpel in the manner I have advised, the nail of the index of the left-hand should be introduced into the groove of the staff, to serve as a conductor to the point or beak of the cutting-director or gorget. The surgeon having no further occasion for the scalpel, must now lay it aside ; and having passed the point of the director or gorget along

his finger into the groove of the staff, he is now to take the handle of that instrument from the assistant, and having raised it from the groin of the patient in which it lay, he must with his left-hand preserve it firm in this situation, while with his right he pushes on the cutting director or gorget till it has passed freely into the bladder; a point of the operation that he knows is accomplished when the urine is perceived to rush with freedom out at the wound. In executing the first part of the operation, the surgeon should be firmly seated; but in passing the gorget or director into the bladder, as likewise in the extraction of the stone, he should stand immediately before the patient, as in this posture these steps of it are more easily performed.

It is a point, I may remark, of the first importance in this operation, to raise the staff to a proper height before pushing on the gorget. The handle of the staff should form nearly, though not entirely, a right angle with the body of the patient; and if

kept sufficiently firm in this position, the gorget or director may be pushed on with safety, as the beak of the instrument, if this direction of the staff is continued, can scarcely escape from the groove in which it runs. But if the elevation of the staff is either much more or less than this when the gorget is pushed forward, the point of the gorget, instead of passing into the bladder, must be forced out of the groove, and passing between the rectum and bladder, or between the bladder and pubes, it must here do a great deal of harm. I have known even expert surgeons, from an unpardonable degree of inattention, fall into this error with regard to the height of the staff. Younger practitioners, therefore, cannot be too much on their guard against it.

Even the greatest attention, however, to the elevation of the staff will not of itself prove sufficient. The surgeon ought previously to see that the director or gorget is exactly fitted to the groove intended to receive it; for if not properly

adapted to one another, the gorget will not run easily, and may therefore be very readily pushed out of the groove of the staff.

With a view to render this part of the operation safe, different inventions have been proposed for fixing the beak of the gorget in the groove of the staff, so as to prevent it from getting out till it has passed into the bladder: But all of these gives some difficulty in passing the instrument; and besides, they do not appear to be necessary, as no operator can possibly go wrong, but from gross misconduct or inattention.

As soon as the gorget has freely entered the bladder, the staff should be withdrawn; and this being done, the next step in common practice is, to introduce the forceps immediately; but as the stone may be frequently felt with the finger, and as no other method serves so effectually to discover its real situation, this precaution of introducing the finger into the bladder ought never to be omitted.

Little additional pain is given by the introduction of the finger, and if the operator is lucky enough to discover the stone, he is thereby instructed with much certainty of the best direction for the forceps.

The situation of the stone being in this manner discovered, or if, upon trial, it is found that the finger will not reach it, forceps, proportioned to the size of the patient, are to be passed into the bladder along with the gorget or director, while the latter is immediately thereafter to be withdrawn.

In an operation of such importance as this, the most trifling circumstance merits attention; for the more obvious and leading parts of it may be performed in the most masterly manner, and yet the whole be rendered unsuccessful by the operator not attending so accurately as he ought to do to the more minute steps of it. Even the method of withdrawing the cutting-director or gorget, is a matter that requires attention; much more, indeed, than it commonly meets with.

After

After the forceps are introduced, the gorget should be slowly withdrawn in the exact direction by which it was entered; for if turned in any degree either to one side or another, it must necessarily make another incision, not only in the prostate gland, but in all the other parts through which it is made to pass; the impropriety of which is too obvious to require any further animadversion.

If the stone has been previously discovered by the finger, it is commonly easily laid hold of with the forceps; but when the finger has not been able to reach it, it is in some instances with much difficulty met with. The forceps must necessarily be introduced shut, that is, with their blades as near to one another as their form admits of; for, with a view to prevent them from laying hold of the bladder, they should be so constructed as not to meet at any part except at their axis, by at least the tenth part of an inch. But as soon as they have entered the bladder, they should be gradually opened;

opened; and in this expanded state should be easily moved about, with their handles sometimes depressed and sometimes elevated, till the stone is discovered, when it should as quickly as possible be laid hold of. It frequently, however, happens, even with expert surgeons, especially when the stone is small, that it is not readily discovered by the forceps. In such instances we sometimes meet with it near to the fundus of the bladder; but it is most frequently found concealed in the under and back part of it, near to its neck, in that bag that I have mentioned as being formed by the natural pressure of the urine. When it is discovered in this situation, nothing will bring it so readily into contact with the forceps, as elevating this part of the bladder by introducing the finger into the rectum.

In general, straight forceps, such as are represented in Plate LXXV. fig. 1. and 2. are preferable to those that are much crooked, delineated in fig. 3. For they not only act with more power in extracting

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ing the stone, but serve equally well with the others for finding it. Every operator, however, should be provided with all the varieties of forceps now in ordinary use.

When the stone is difficult to discover, the surgeon is apt to allege, that this proceeds from its being contained in some preternatural bag or cyst; and when laid hold of with the forceps, and an unusual degree of strength is required to extract it, this is commonly said to arise from the stone adhering to the coats of the bladder. That the weight of a stone will sometimes form a partial cavity for itself, by pressing that part of the bladder on which it lies into the neighbouring soft parts, there is no reason to doubt; and in some instances the bladder is found so much contracted round a stone, as to form almost two distinct bags. This, however, is a rare occurrence; and the adhesion of stones to the bladder, I believe to be still less frequent, if it ever takes place. Stones have indeed been frequently

ly found covered with the coagulable part of the blood, which in some instances becomes so firm and tough, as to have the appearance of an organised membrane; but we are perfectly unacquainted with any process of nature by which an adhesion can be produced between the bladder and a stone contained in it.

It cannot possibly happen by any communication of blood-vessels betwixt the bladder and stone; and it is equally improbable, that it can be produced merely by agglutination; for, by the intervention of the urine, with which the bladder is constantly moistened, such an effect must be with certainty prevented.

But it is not reasoning alone that militates against this opinion. For although such an occurrence has been frequently mentioned by authors, yet we do not meet with one authenticated instance of any firm adhesions betwixt the bladder and stones contained in it being discovered after death. I am therefore led to conclude, that this idea is entirely void of foundation;

foundation; and that it has probably arisen from the misconduct of operators, who, by making the external incision too small, or not dividing the muscles and prostate gland sufficiently, have experienced much difficulty in extracting a stone of even a moderate size, and who, to escape censure, have suggested the possibility of stones adhering to the internal coat of the bladder.

When the stone is laid hold of with the forceps, the operator, before he proceeds to extract it, ought to introduce his finger into the bladder, in order to discover whether it is properly fixed in the forceps or not. This in various instances proves useful, for on finding that a stone of considerable length is laid hold of in such a manner as to have its longest diameter made to press in a tranverse direction with respect to the opening in the bladder, much pain and laceration, which would undoubtedly occur from extracting it in this direction, may be easily prevented, either by turning the stone with
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the point of the finger, when this can be done, or by letting it slip altogether out of the forceps, and again endeavouring to lay hold of it in a more favourable position. When the operator is certain that this is properly done, he is then to extract the stone in a very slow and gradual manner. The forceps should be very firmly held in both hands, his right being applied towards the extremity of the handles, and his left near to the common axis.

In common practice, if the stone does not come readily away, the force made use of is applied so as to dilate the parts equally in every direction. The stone is made to move not only upwards and downwards, but laterally; and, by some, even a rotatory motion is given to it. Nothing, however, can be more destructive than this to the parts through which the stone must pass, while at the same time it is evidently ill calculated for facilitating the extraction.

Instead

Instead of moving the stone in this manner, the pressure ought to be made almost entirely downwards; not directly from the symphysis of the pubes towards the anus, but in the course of the external wound, which ought, as I have already observed, to run at an equal distance between the anus and tuberosity of the ischium. As it will be admitted, that the force employed in extracting a stone must prove more useful when exerted upon parts that are soft and of a yielding nature, than when applied immediately upon a bone; so, whoever attentively considers the anatomy of the parts concerned in this operation, will see the propriety of the advice I have given. The opening into the pelvis is at this place so narrow, that a very slight examination must render it evident, that in extracting a stone no advantage can be derived from lateral pressure. If again the stone is forced upwards, it must press against the bones of the pubes; for in this direction nothing intervenes between
these

these bones and it, except the urethra, and a small quantity of cellular substance: And if directed towards the anus, it must press the rectum against the point of the coccyx; a circumstance that must not only give much immediate distress, but which must even add greatly to the hazard of the operation.

The rotatory motion which in this operation is sometimes given to a stone unites all these disadvantages; but by carrying the pressure downwards in the course of the wound, so as that it may fall between the anus and ischium, every inconvenience of this kind is avoided, and a more extensive dilatation is obtained than can possibly be procured in any other direction.

By a proper and gradual application of pressure in this direction, the stone, if not uncommonly large, will be at last extracted: In the course of the extraction, however, if the operator meets with much resistance to the passage of the stone, he should examine the state of the divided parts, and if any part of the muscles that

ought to have been cut are still found entire, they should be immediately laid fully open; and the easiest method of doing it, is, to secure the stone in the forceps with the left hand, while with a scalpel in the other a complete division of the muscles is accomplished.

With a view to prevent the forceps from pressing so much upon the stone as might break it, some proposals have been made for rendering the degree of pressure made by forceps steady and certain. Of these the best seems to be what is represented in Plate LXXVI. fig. 3. in which, as soon as the stone is laid hold of, it is preserved in the same position by means of a screw that passes from one of the handles into the other. This, however, I consider as a very unnecessary addition to forceps; for when a stone is small, no surgeon of experience will apply great force to extract it; and when of a large size, it will be more for the patient's advantage that it should break than be extracted entire.

I have spoken already of the hazard arising from the extraction of large stones. It is indeed so considerable, as to warrant this conclusion, that, *cæteris paribus*, the hazard attending lithotomy may be considered as corresponding to the size of the stone to be extracted. In healthy subjects, when the stone is small, and the operation properly performed, scarcely one in twenty die, but, although a few have recovered from whom stones of a large size have been extracted, yet whenever the stone has exceeded seven or eight ounces in weight, so far as I can discover, not above one in ten have recovered.

This, therefore, is a very important circumstance, and worthy of our most serious attention; and although the breaking of a stone in the course of extraction, is in other respects disagreeable, yet, with a view to obviate the dreadful consequences of tearing out a large stone, when in the course of an operation it is found that it is uncommonly large, and that it cannot be taken out but with much hazard

to the patient, might it not be more eligible, either to endeavour to break it with the forceps already introduced, or to withdraw these, and to introduce others more fit for the purpose? In Plate LXXVII. fig. 1. is delineated forceps of this kind, originally invented by Andreas à Cruce, and since improved by Le Cat and others: By means of the long and strong teeth with which they are furnished, and especially by the intervention of the screw for compressing their handles, almost any stone may be broken into small pieces; and this being effected, the different pieces fall to be extracted with common forceps.

In such circumstances, however, or when a stone has broken by accident in the course of an operation, the utmost care is necessary in order to extract every fragment; for, if the smallest particle is left, if it be not afterwards washed off with the urine, it may prove highly detrimental, by serving as a nucleus for the formation of another stone. After all
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the larger pieces have been extracted with the forceps, a scoop, such as is represented in Plate LXXVII. fig. 2. proves sometimes useful for taking out the smaller particles; but for this last purpose nothing answers so well as injecting large quantities of tepid water into the bladder, either with a syringe or bag and pipe. This may be done with entire safety, and it commonly answers the purpose for which it is employed.

When a stone is found to have a smooth polished surface, it is commonly supposed that others remain in the bladder, as this smoothness is supposed to arise from the friction of other stones; while a rough unequal surface is supposed to denote the existence of one stone only. No dependence, however, ought to be placed upon these circumstances: For we daily meet with instances of a single stone with a smooth surface; and of stones with rough unequal surfaces having more than one in the bladder. As soon, therefore, as one stone is extracted, the operator, instead

of trusting to any external appearances, should first search the wound with his finger, as far as it will reach, and then, either with common forceps, or with the thick curved instrument represented in Plate LXXII. fig. 1. which may be termed a Searcher, and which answers the purpose better; and as long as any stones are discovered, the forceps should be repeatedly introduced till the whole are taken out.

In the course of this operation, some blood-vessels, as I have already observed, are unavoidably divided; but when the incision is kept low down in the perinæum, in the manner I have directed, and when therefore the bulb of the urethra is avoided, there is seldom much risk to be dreaded from any hemorrhagy that ensues. It sometimes, however, happens, that those branches of the internal iliac artery that supply the parts lying anterior to the prostate gland, are so considerable as to pour out a good deal of blood: But as a free discharge during the
operation

operation proves to be the most effectual preventative of inflammation, a symptom more to be dreaded than any other in lithotomy, nothing in general should be done, except in very weak habits of body, to put a stop to the hemorrhagy till all the stones are extracted; when, if the discharge still continues, any artery that appears should be secured with a ligature; and if the external incision has been made large and free in the manner I have advised, this part of the operation does not prove so difficult as is commonly imagined. In different instances, I have passed a ligature upon an artery almost as deep as the prostate gland; and when a large vessel has been cut, the advantage derived from this effectual method of securing it, is of itself a very important argument for making the external incision in every instance free and extensive.

When, however, the divided vessel cannot be secured with a ligature, we are then to endeavour to stop the hemorrhagy by pressure; and for this purpose a

firm roller introduced at the wound would answer: But in order to avoid any stop to the flow of urine, instead of a solid roller, a silver canula covered with soft linen may be employed. Of this instrument I have given a representation in Plate LXXVII. fig. 3.

Notwithstanding, however, of every precaution, some of the deep-seated arteries, divided in the operation, continue sometimes to pour out a great deal of blood, and which, instead of passing off by the wound, is, in some instances, collected in great quantities in the cavity of the bladder. As soon as this is perceived, some means should be attempted for removing the blood; and the most effectual of these are, to extract as much of it as possible, by a proper use of the scoop, Plate LXXVII. fig. 2. and afterwards by injecting warm water at the wound, to wash off the remainder. In this manner very large collections of blood may be removed; and when, as has sometimes happened, means of this kind have not
been

been employed, the coagulum has at last become so firm, and has filled the cavity of the bladder so completely, as to prevent entirely all further deposition of urine. In this case the belly becomes pained and swelled; fever takes place; and death itself very commonly succeeds.

With a view to prevent this unfortunate issue with as much certainty as possible, every patient should, immediately after the operation, be laid in such a posture as may with most certainty tend to discharge any blood that may fall into the bladder. Instead of laying the head low, and the buttocks high, as is commonly done, the pelvis should be lower than the rest of the body; by which the wound is kept in a depending posture, which serves to assist the discharge of any blood that the arteries may pour out. As soon as the flow of blood is stopped, the patient should be untied, and a piece of soft lint being inserted between the lips of the wound, the thighs should be laid together, and in this position he should

should be carried to bed ; and an opiate being given, he should for some time be left entirely to the charge of an experienced nurse. No dressing answers so well as dry lint ; for as the urine is constantly passing off by the wound, and as the parts are thereby kept wet, which makes them apt to fret, a frequent renewal of dressings becomes necessary ; and nothing is either more easily applied or removed than a piece of dry lint.

When the stone has not been difficult to extract, the patient generally remains free from much pain ; and he frequently falls into rest, and sleeps during the first three or four hours after the operation : But when the stone is large, and when much violence has been done to the parts in taking it out, severe pain in the under part of the belly often supervenes in the space of an hour or two from the operation ; and this, I must observe, when not soon removed, is one of the most alarming symptoms that takes place. When merely spasmodic, however, which in some instances

instances it appears to be, it is commonly soon removed by the use of warm fomentations to the belly, or by emollient anodyne injections thrown up by the rectum.

When by perseverance in these remedies the pain is found to abate, little or no anxiety need be entertained on account of it; but when, instead of becoming less violent, it proceeds to increase, and especially when the belly becomes hard and tumefied, and the pulse full and quick, much danger is to be dreaded. As these symptoms almost constantly proceed from inflammation, blood should be taken in quantities proportioned to their violence; emollient injections should be continued; and if the local application of heat to the abdomen, either by warm flannels, or by warm water contained in a bladder, does not answer, the patient should be immediately put into a semicupium. In such circumstances, indeed, I have experienced more advantage from this than from any other remedy; for it not only conveys

veys the heat more directly to the parts affected, but a free discharge of urine by the wound is also more commonly procured by it than in any other manner, so that much relief is often obtained from it.

A due perseverance in these means, with a proper use of opiates, a low diet, and a free use of diluent drinks, will frequently remove very alarming symptoms. But, in some instances, all our efforts prove fruitless: The pain and tension of the abdomen continue to increase; the wound, instead of putting on a florid, healthy, appearance, remains sloughy and ill-conditioned; the quickness of pulse, and other symptoms of fever, increase; and death closes the scene. But, when matters terminate happily, the wound by degrees becomes red and of a healthy aspect: The urine, in some instances, passes by the urethra from the first; but in most cases it comes away by the wound for the first two or three weeks: The pain in the belly gradually abates;

abates; and any symptoms of fever which prevailed at first, are in a short time entirely removed.

The period at which a complete cure of the wound is accomplished, is exceedingly various, and depends on the state of health the patient is in: In some few cases of young healthy boys, I have known it completely cicatrised in less than three weeks; but in others, not till the sixth, seventh, or eighth week. In some instances, again, although a great part of the sore heals perhaps quickly enough, yet a small opening is left, at which the urine continues to be discharged, and, the edges becoming callous, a real fistulous opening is produced, that cannot be cured but by another operation; the manner of performing which I shall presently have occasion to mention. Indeed the prevention of fistulous openings depends much on proper attention in dressing the wound. If care is taken to introduce the lint sufficiently within the lips of the wound, till granulations fill it
up

up at bottom, there will seldom be any risk of fistulous sores: At the same time, however, the wound ought not to be crammed, either with lint or any other dressing: For in this case the edges must either inflame, or acquire a morbid degree of hardness. In other respects the treatment here should be nearly such as is known to answer in similar wounds in other parts. It is proper, however, to observe, that nothing removes that excoriation of the buttocks with such certainty, that sometimes proves troublesome after this operation, from their being kept constantly wet with the urine, as frequently bathing with brandy or any other ardent spirit, or with lime-water.

Where the constitution is much enfeebled, an incontinence of urine is apt to succeed to this operation. For the removal of this, nothing proves successful till a recovery of strength has taken place. A light invigorating diet, together with the use of the cold bath and Peruvian

Peruvian bark, are, therefore, our principal remedies. But, in order to obviate the immediate disagreeable effect of a constant discharge of urine, different instruments have been invented. Some of these have in view the compression of the penis, in order to prevent the urine from being discharged; and others, while they are so formed as to be concealed within the patient's breeches, are meant to serve as receptacles for the urine on its passing from the urethra.

In Plate LXXVIII. fig. 1. is represented the most convenient form of the former of these; and in fig. 2. of the same Plate, as well as in Plate LI. fig. 2. are delineated receivers, which by experience have been found to answer the purpose of the latter both with ease and certainty, which may also be used in all cases of incontinence of urine, whether arising from this operation or from any other cause.

While from the shortness of the urethra in women they are less liable to the
stone

stone than men, the operation of lithotomy with respect to them, is, on the same account, much more simple, and of course more easily performed, and accompanied with less hazard. It cannot be done by cutting from the perinæum, in the same manner as in male subjects; for, as the urethra and bladder lie immediately above the vagina, any opening made into them from the perinæum, would pass through the vagina, so as to wound it both above and below. There is no necessity, however, for hurting the vagina, as the urethra may be divided from one end to the other, without any risk of touching it.

The patient being placed upon a table, and secured in the manner I have already advised for male subjects, a grooved staff, such as is represented in Plate LXXI. fig. 5. is to be introduced into the bladder, by passing it along the urethra, which lies between the nymphæ, immediately below the clitoris; and the operator, keeping the staff firm with his left-hand,

is with his right to introduce the beak of the cutting director, fig. 1. of the same Plate, or of the gorget, fig. 2. Plate LXX. into the groove, and to push it easily along till it has fairly entered the bladder. The staff should now be withdrawn, when the operator, as in male subjects, should introduce his finger along the director; and having discovered a stone, should proceed to extract it in the manner I have advised above.

By the old method of cutting in females, namely, with the greater apparatus, no incision was made into the urethra, but different instruments were used for dilating it; and this being sufficiently accomplished, the forceps were employed for extracting the stone. In this manner, however, the parts were much lacerated; the patient suffered a great deal of unnecessary pain, and the bladder was commonly deprived of all power of retention. I have therefore no hesitation in giving a preference to the method of operating I have pointed out, in which the urethra is

cut through its whole length, instead of being lacerated or torn.

As the bladder in females lies immediately above, and quite contiguous to, the vagina, it has been proposed, that instead of laying open the urethra, as I have advised, an opening should be made directly into the bladder from the vagina, at which the forceps are to be introduced for extracting the stone. One case of this kind is recorded by Buffiere *; and, more lately, other three are related by the ingenious Mr Gooch, in which this method of extraction was successfully employed †. It has never, however, been generally adopted; and as various objections occur to it, I do not suppose that it will ever be frequently practised.

By cutting into the bladder through the vagina, parts are injured, which by the other method are avoided: The stone; when

* Philosophical Transactions for the year 1669, p. 106.

† Vide Cases and Remarks in Surgery, vol. ii. p. 182. by Benjamin Gooch.

when it does not lie directly upon the vagina, is with difficulty laid hold of; it cannot be so easily extracted as when drawn along the course of the urethra; fistulous openings must probably occur more frequently after this method of operating than after the other; and if the woman should afterwards become pregnant, the cicatrix formed in the vagina would produce pain, obstruction, and perhaps laceration in the time of delivery.

One great advantage derived from the lateral operation, in its present improved state, both in males and females, is, that no laceration is produced by it unless the stone is remarkably large; in which case, no precaution can altogether prevent it: But, in a great proportion of cases, if the parts are freely divided in the manner I have advised, all the risk attending laceration, and which I have endeavoured to point out as the most hazardous part of this operation, is avoided with certainty.

I have thus described the various means hitherto employed by practitioners, for extracting stones from the bladder; and from what has been said, it appears, that the lateral operation is, in ordinary cases, greatly preferable to every other. It stands indeed so eminently superior to the others for general use, that it does not appear necessary to draw any farther comparison between them; but, as I have already observed, particular cases sometimes occur in which the high operation may with propriety be employed instead of it: I have already in strong terms pointed out the risk of extracting a large stone by the lateral operation; and I have shown, that stones of any magnitude that the bladder can contain, may be taken out by the high operation. When, therefore, it is with any tolerable certainty known, that a stone is uncommonly large, and when the high operation is in other respects admissible, it ought certainly in every such instance to be preferred: For although where stones
are

are large it may be better to break them into small pieces in the manner I have directed, than to lacerate the parts by taking them out entire; yet the practice is only adviseable when the operator unexpectedly meets with a large stone after the bladder has been cut into; so that wherever it is previously known that a stone is large, much advantage may be derived from a judicious choice, on the part of the operator, of his method of operating.

In the directions that I have given for performing the lateral operation, the dictates of experience are strictly adhered to, and I have recommended nothing that is not either at present very generally adopted, or that I have not myself put in practice.

Many proposals have been made by individuals for the improvement of the operation of lithotomy, particularly of the lateral method of cutting: But a minute detail of all that has been suggested upon the subject, is incompatible with the na-

ture of this work ; nor could it serve any purpose, but to bring into view some particular modes of practice, which were either never generally followed, or which, if adopted, have fallen again into disuse.

The most remarkable of these proposed improvements of the lateral operation, are those of three French surgeons, Monsieur Foubert, Monsieur Thomas, and Frere Cosme. The two first invented instruments for penetrating the body of the bladder, without wounding the urethra, The bladder being distended with urine, and an incision made through the skin and cellular substance, a cutting instrument of a particular construction is then pushed past the urethra into the side of the bladder ; and an opening being made of a sufficient size, the stone is extracted in the usual manner. One material advantage expected from this, is, that by the urethra and prostate gland being avoided, that inability to retain the urine, and other troublesome consequences, which sometimes ensue from injuries done to these

these parts, are not so apt to occur when the body of the bladder alone is wounded. But, independent of other objections to which this method of operating is liable, the wound in the bladder being sure to recede from the wound in the teguments as soon as all the water contained in it is discharged, must necessarily prevent it from being ever adopted; for the urine, not finding a free passage by the wound, must pass into the contiguous parts, where it must always excite very distressful consequences.

So that although this method of cutting directly into the neck or body of the bladder, is, at first view, extremely plausible, yet the least reflection on the consequences that it would frequently excite, must at once bring conviction of the great risk that attends it.

The operation of Frere Cosme is, in effect, the same with the lateral operation, as it is now commonly practised. The parts cut in it are exactly the same, only they are divided in a different manner.

After the staff is laid bare in the usual manner, the beak of the instrument, fig. 1. Plate LXXVI. is introduced into the groove; and being pushed forward till it reaches the bladder, the spring E is then pressed down, so as to raise the knife from its sheath, when the operation is finished, by withdrawing the instrument in such a direction as may divide the neck of the bladder and prostate gland, in the same manner as is done by the common gorget: After this, the other steps of the operation are to be completed, in the manner directed above, with the forceps alone.

Most of the other deviations from the established mode of practice, hitherto proposed by surgeons, consist, either in some improvement of the cutting gorget of Mr Hawkins, or in a preference which some practitioners still continue to give to the knife. I have already observed, that Mr Hawkins gorget does not spread sufficiently at the cutting part of it, and that it is wider and deeper behind than it ought to be, by which it is liable to tear and otherwise

wise

wife injure the urethra more than is necessary. This inconvenience, however, is removed by the cutting director that I have ventured to recommend, as delineated in Plate LXXI. and in a great degree by the gorget, fig. 1. and 2. Plate LXX.

In regard to the preference given by some to the scalpel, not only to the director, but to the cutting gorget, I have only to observe, that an expert surgeon of steadiness, and possessing a minute knowledge of the anatomy of the parts, may with ease and safety perform the operation with the knife alone; but I must also remark, that, when the scalpel only is employed, the danger of wounding the rectum would in common practice be very great, so that the gorget or cutting-director, by either of which the gut is completely defended, ought to be commonly preferred.

In the course of this section, I have endeavoured to deliver all that is worth recording, of modern practice in the operation

ration of lithotomy : I am not conscious of having omitted any improvements of importance ; and I hope it will appear that I have proposed some that are not generally known, or which, if known, are not commonly practised.

The operation of lithotomy being one of the most important in the department of Surgery, I have been induced to extend this section to a great length : It may therefore prove acceptable, to students especially, to have such circumstances enumerated in a more concise manner, as particularly merit their attention.

1. I have already in strong terms pointed out the propriety of an absolute certainty being attained, of a stone existing in the bladder, before the operation of lithotomy is proposed : And I have endeavoured to show, that no symptoms, however strongly marked, afford sufficient evidence of the presence of calculus ; the operation of sounding, or touching the stone with a staff, being the only certain

tain means we have of judging of its existence.

2. Before proceeding to the operation, a considerable quantity of urine should be allowed to collect in the bladder; the rectum should be emptied by an injection; the buttocks should be raised above the rest of the body, and the external incision should be more extensive than is commonly advised. In full-grown adults, instead of the usual length of an inch and half, or two inches, it should be at least three inches and a half long; care being taken to commence the cut at the inferior edge of the pubes, and to continue it in an oblique direction, till it has passed the anus, at an equal distance between the end of the rectum and the tuberosity of the ischium.

3. As the chief resistance to the extraction of the stone, proceeds most commonly from the muscles covering the urethra, these ought to be freely divided: No danger can ensue from this, and much advantage may be derived from it.

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4. But although a free division of the muscles is of much importance, there is no necessity for cutting so much of the urethra as is commonly done: It does not facilitate the extraction of the stone, and it makes the operation more hazardous than when the membranous part of it only is divided. When the incision is carried through the teguments and muscles, so as to leave the staff covered by the urethra only, the operator should insert the index and middle finger of his left-hand into the bottom of the wound, by which means the rectum is completely protected; and this being done, an opening should be made in the urethra with the point of the scalpel, very near to the prostate gland, from whence the incision should be extended upwards to the bulb, but no farther. This, I may remark, should be done by one stroke of the knife, and not by repeated incisions, as is commonly done; for by this means a rugged unequal wound is produced. In the first part of the operation, the edge of the
knife

knife should be applied in such a manner as to cut from above downwards, as in this manner the incision is accomplished both with ease and safety; but in dividing the urethra, the back of the knife ought to be turned down, while the edge of it penetrates the urethra, and runs along the sulcus of the staff. In this manner we cannot possibly hurt the rectum; which is too frequently done in the usual method of performing this part of the operation.

5. We have now to divide the prostate gland, with a small portion of the neck of the bladder. This, I have observed, may be done with ease and safety, with the scalpel alone, by a good anatomist, accustomed to operate, and whose hand is perfectly steady; but as the prostate gland must be divided in such a direction as to avoid the rectum, with which it is connected behind, and likewise the excretory ducts of the vesiculæ seminales which terminate here, much accuracy is required to get it accomplished, and it can only be done with

safety to these parts by a lateral cut through this gland. A very small variation in the direction of the scalpel, might be productive of great danger; and few practitioners being possessed of such equal steadiness as the certain prevention of this requires, a knife, constructed in such a manner as to protect the rectum, at the same time that it divides the prostate gland properly, ought certainly to be preferred. The gorget of Mr Hawkins is possessed of all these advantages; but I have likewise shown, that it is attended with some disadvantages. These, however, are obviated by the cutting director - I have already described, as well as by gorget, Plate LXX. fig. 1. and 2. which make a more clean and ample cut than the common gorget, at the same time that they do not tear the urethra, as the gorget of Mr Hawkins always does, by being made to expand too much behind.

6. After the stone is laid hold of with the forceps, it should be extracted in a slow and gradual manner; not by a rotatory

tory motion, or by pressure applied equally in all directions ; but by endeavouring to stretch the parts along the course of the wound in a line directly between the anus and tuberosity of the ischium. Moderate lateral pressure may likewise have some influence ; but no force should ever be applied towards the upper part of the wound ; for nothing can be gained by doing so, and it must always do harm, by pressing the urethra against the pubes. When, in the course of extraction, it is found, that the passage of the stone is impeded by some of the muscles not being freely divided, this ought still to be done, by the operator keeping the stone firm in the forceps with one hand, while, with a scalpel in the other, he cuts what is necessary.

7. The stone being extracted, soft easy dressings should be applied to the wound: And the patient should be laid in bed with his head and upper part of his body raised higher than the pelvis, so that any blood poured out from the wound, may be free-

ly discharged, instead of lodging in the bladder, which it is otherwise apt to do.

Having thus enumerated such points in this operation as particularly merit attention, I shall now proceed to consider the operation of Néphrotomy.

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SECTION VIII.

Of Nephrotomy.

WHEN one or more stones are impacted in the kidneys, so that they cannot pass off with the urine, they give rise to a train of very distressful symptoms, which at last almost constantly terminate in the death of the patient.

The severity of the pain is frequently so great, as to have induced practitioners to suggest an operation for extracting the stones. This consists in a cut made through the common teguments and muscles, immediately above the kidney, with an opening into the kidney itself, of a sufficient

size to afford a free passage for a stone of any ordinary size.

But we are to remember, that, however marked the symptoms of stone in the kidney may appear to be, that it is impossible to judge of it with precision. We know that stone in the kidney occasions pain in the region of the kidney, together with sickness and vomiting, and a discharge of urine, sometimes mixed with blood, at other times with mucus, and in some instances with purulent matter. We also know, however, that the same symptoms are not unfrequently induced by other causes, particularly by inflammation and consequent suppuration of the kidney. Many instances, indeed, have occurred of the most violent nephritic symptoms subsisting for a great length of time, where stones were suspected as the cause; but where, instead of this, the kidney has been found, on dissection, to be completely suppurated, and as it were

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entirely

entirely dissolved, a quantity of purulent matter being all that it contained.

Even in calculus of the bladder, a disease less ambiguous than nephritis calculosa, the symptoms are never so distinct and characteristic as to render the operation of lithotomy adviseable, unless a stone is discovered by the sound. But in diseases of the kidney, suspected to proceed from stone, we are deprived of this means of distinction; so that it might not unfrequently happen, that, after laying the kidney open, no stone would be found. This is, therefore, a very important objection to the operation in question.

But it is to be farther observed, that the kidneys do not lie near the surface of the body; although not entirely covered by the inferior false ribs, yet that these ribs project so much over them, as to stand much in the way of an operation; and that, in corpulent people, the kidneys are scarcely accessible.

Hence, it is impossible to make an opening into the kidney with so much accuracy and precision, as the near contiguity of the neighbouring large blood-vessels would require; and whoever attempts the operation of nephrotomy, even on the dead body, will find it difficult, or perhaps impossible to cut into the pelvis of the kidney, without opening some of the large blood-vessels that belong to it: The great and immediate danger from such an occurrence, is too obvious to require to be farther mentioned.

When, indeed, the inflammation, induced by a stone in the kidney, terminates in an abscess, and when the matter thus collected forms a tumor in which a fluctuation is distinguished, little or no danger can ensue from laying it open: And in such an event the stone that produced the tumor will either be discharged along with the matter; or it may, if it can be laid hold of, be afterwards taken out with safety.

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The stone being thus taken out, the opening through which it passed, if the patient recovers, will either heal by the usual means employed for abscesses in other parts; or the most unfavourable termination that can probably happen, will be a fistulous sore, through which a mixture of pus and urine will continue to be discharged.

Upon the whole we may conclude, that when not directed by the appearance of a tumor to the part that ought to be opened, the uncertainty of the ground upon which we proceed when we undertake this operation,—the difficulty of performing it,—and the very imminent danger that attends it, will more than counterbalance any advantage that can ever probably be derived from it; so that the operation of nephrotomy will never probably be received into general practice, however much it may be recommended by some, who, in order to raise a reputation which they might not otherwise obtain, will

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sometimes

sometimes step forward and propose with confidence what no practitioner of character would think right to attempt*.

* For farther information on the subject of Nephrotomy, see Rossetus de partu Cæsareo, cap. vii. sect. 4. Philosophical Transactions for the year 1696. Schenkii Observat. Med. lib. iii. Juncker's Conspect. Chirurg. tab. 93. Edinburgh Medical Essays. Memoires de l'Academie Royale de Chirurgie de Paris.—And Merry's Observations sur la Maniere de Tailler.

SECTION IX.

Of Stones in the Urethra.

PATIENTS liable to calculous complaints frequently pass small stones along with their urine. When these stones are smooth and not very large, they usually come off with little difficulty; and in some cases stones even of a very considerable size are passed without exciting much pain. But when an angular or rough stone is pushed into the urethra, if not so small as to pass off with the first flow of urine, it never fails to create a great deal of distress.

Pain is the first symptom produced by a stone lodged in the urethra; and to this succeed inflammation, tumefaction of the parts, and always a partial and frequent-

ly a total suppression of urine. In some instances, when a stone in this situation is long neglected, this suppression and consequent tumefaction terminate in a rupture of the urethra ; in consequence of which, the urine escapes into the contiguous cellular substance, and very troublesome swellings arise not only in the body of the penis, but frequently in the scrotum, and through the whole course of the perinæum.

The treatment suited to such tumors will be pointed out when we come to treat of fistulous sores in these parts : I shall now only relate the easiest and most effectual means of extracting stones lodged in the urethra. As soon as it is known that the urine is stopped by a stone fixed in the urethra, nothing should be omitted that can tend to remove it speedily.

When a stone has been long fixed at one particular part without yielding in any degree, and when the pain and inflammation that it excites are considerable, it ought to be cut out in the manner I shall
hereafter

hereafter advise; but on first passing down from the bladder to the urethra, we frequently succeed by more gentle means.

Whether or not the urethra itself is possessed of any contractile power, is a point not to be easily ascertained: But the muscles with which it is immediately connected, are in common with other muscular parts subject to the influence of stimuli; and as nothing with which we are acquainted, can be supposed to give a more powerful stimulus to a sensible part than the irritation of a rough or angular stone, so we may fairly conclude, that when once a stone is impacted in the urethra, its farther passage along that canal will be impeded by a spasmodic contraction of the contiguous muscles. One very important indication, therefore, in the treatment of this malady, is, the removal of spasm; and when we keep this idea in view, and continue to persist in the use of proper remedies, we seldom fail to bring off such stones as have been lodged in the urethra, without the aid of any
chirurgical

chirurgical operation. But, instead of the application of means calculated for the removal of spasm, the ordinary practice of surgeons is the direct reverse, and is therefore apt to produce a very opposite effect.

An attempt is commonly made to push the stone forward at once with the fingers. It is obvious, however, that until the spasm by which the obstruction is partly produced is removed, every trial of this kind will rather tend to increase the complaint. For this reason, therefore, no pressure should be employed till the most effectual means have been used for removing the spasm produced by the stone. With this view, the patient, if he is plethoric, ought to lose a considerable quantity of blood by the lancet; or, if he is thin and emaciated, a proportional quantity should be discharged by leeches, directly from the part affected. A quantity of warm oil should be repeatedly injected into the urethra, in order to lubricate the passage as much as possible.—

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The patient should be immersed in a warm bath, — and a full dose of laudanum should be given about an hour before going into the bath.

Together with these remedies, a plentiful use of diuretics, and diluent drinks, is commonly prescribed: But, instead of proving useful, they almost constantly do harm. For, when the urine rushes out with violence, if it does not carry the stone freely out of the urethra, it tends to fix it more firmly than before; and the pain thus produced, will always increase the inflammation, tension and spasm of the parts affected: So that whatever has much effect in increasing the quantity of urine should be carefully avoided.

A proper quantity of blood having been discharged; the patient having remained for a sufficient length of time in the warm bath; and the opiate having begun to operate; the parts will thus be as completely relaxed as possible: And this is the period when some attempt should be made

made for extracting the stone.—Various instruments have been contrived for this purpose, particularly long small pliers or forceps concealed in a canula of a size corresponding to that of the urethra; but as none of these have ever proved useful, and as they often do much harm by tending to increase the irritation in the urethra, I do not think it necessary to delineate any of them.

Instead of using these instruments, the surgeon should at first endeavour by gentle pressure to push the stone forward along the urethra, and by continuing to move it easily in different directions, and persevering for a considerable time, we often succeed in bringing off stones that otherwise must have been cut out.

It frequently happens, however, that stones of such a size and figure get into the urethra, as cannot by any means be made to pass off. When a stone, thus fixed in the passage, is of such a form as to admit of the urine being discharged, a patient, rather than submit to an operation,

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tion, will sometimes allow it to remain; by which the stone, in a short time, commonly obtains an increase of size by a deposition of earthy matter from the urine: Of this I have met with various instances, in which the stones became very large, and in which the urethra was so dilated as to form an extensive pouch or cavity corresponding to the size and figure of the stone. But when the stone, instead of allowing any of the urine to pass, fills up the urethra entirely, it becomes necessary to remove it by an operation as soon as the means that I have advised have been found to prove of no avail.

This operation consists in cutting directly upon the stone, and extracting it either with a scoop, or with small forceps; but the methods of effecting this ought to vary according to the part of the urethra in which the stone is fixed. When a stone is situated near to the beginning of the urethra, and contiguous to the bladder, it has been advised to push

it again into the bladder by means of a staff: But as it might there probably acquire a larger size, and would consequently render the patient liable to all the distress and hazard arising from a stone in the bladder, this is a practice by no means to be admitted, as the stone may be extracted with much more ease from any part of the urethra, and with much less hazard to the patient, than is always incurred by the more formidable operation of cutting into the bladder.

When, therefore, an operation is necessary for extracting a stone fixed in the urethra near the neck of the bladder, the method of performing it is this.

The patient should be laid upon a table, and secured in the manner I have directed for lithotomy: And an assistant suspending the scrotum and penis, the surgeon, after oiling the first and second fingers of his left-hand, should introduce them into the anus, and by means of them ought to press firmly upon the parts immediately behind the stone; which will not only enable

enable him to lay it bare with more ease, but will be the surest method of preventing it from being pushed into the bladder by the necessary pressure of the knife. This being done, an incision should be made through the common teguments and urethra, so as to lay the stone completely bare; which may now be either turned out by a due degree of pressure applied with the fingers in the rectum; or, if this is not sufficient, it may be taken out either with a scoop, or with common small forceps.

The after treatment is the same here as I have advised in the operation of lithotomy.

When; again, a stone has passed farther on in the urethra, in order to extract it, the skin should be drawn as much as possible past it, either in a backward or forward direction; and the stone being now secured in its situation by pressure, a longitudinal cut is to be made upon it, directly through the skin, cellular substance, and urethra, of a sufficient size to admit
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of its being extracted, either with the scoop or forceps. The edges of the wound are now to be completely cleared of fabulous particles, and the skin allowed to regain its natural situation: By which means, if the operation has been properly done, the wound in the urethra will be entirely covered with skin that has not been injured: a circumstance that tends to render the operation much less formidable than it otherwise would be; for the wound in the urethra is thus so well protected, that it commonly heals by the first intention.

It sometimes indeed happens, that in voiding urine, part of it escapes at the wound, and insinuates into the contiguous cellular substance. This, however, is a rare occurrence, and the inconveniences that arise from it are easily obviated, by laying open any collection of urine that takes place during the cure.

When a stone fixes near to the point of the yard, in that part of the urethra running through the glans; if it is so near as

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to be seen, it may frequently be taken out with small dissecting forceps : And in order to facilitate the extraction, when it cannot be otherwise done, the end of the urethra may be dilated with the point of a bistoury : But when this fails of success, an incision must be made upon the stone in the manner I have directed where the urethra is covered with skin. Soft dressings should be applied to the wound ; and when the cure is nearly completed, a hollow bougie, a short silver tube, or a catheter of elastic gum, should be passed into the urethra, in order to preserve it of a proper size.

The most perplexing situation in which a stone can be fixed in the urethra, is just behind the scrotum ; for if the stone is either forced into the scrotum, or if it becomes necessary to make an opening into it with a scalpel, the urine is apt to collect in it, from which a great deal of distress always ensues.

In order, therefore, to obviate this inconvenience, as soon as a stone is disco-

vered in this situation, we should endeavour, with all possible attention, either to get it carried farther along the urethra, or, if this cannot be done, to push it back into the perinæum with a staff: But when this is found to be impracticable, and that the stone must be extracted, an incision should be made in the urethra, by beginning the cut at the under part of the scrotum, immediately to one side of the septum, and proceeding upwards till the stone is distinctly felt, when it is to be laid bare and taken out in the manner I have already pointed out.

By making the incision from below upwards, any urine that escapes from the urethra finds a free passage; and if the opening is sufficiently large, the stone may in this manner be extracted easily: During the operation, the testes should be as much protected as possible, by an assistant pulling them separate; and when this is properly done, there is no danger of their being injured. After the operation, the dressings should be applied in
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such a manner, that the fore may heal from the bottom; for this being neglected, and the teguments allowed to heal before every vacancy is filled up, purulent matter, and perhaps urine, will very probably collect, and may thus give rise to troublesome sinuses.

When urine continues to be discharged for any length of time at a preternatural opening of the urethra, whether the consequence of the operation of lithotomy or of any other cause, if the calculous diathesis prevails, stones of a large size will frequently form in the cellular substance contiguous to the opening. I have met with several instances of this: In some the stones were small, and easily taken out; but in others, where they spread and occupied a considerable portion of the cellular membrane, they were very difficult to remove*. The treatment here consists solely in making a free incision

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* A very remarkable case of this nature is recorded by Gooch. See Cases and Practical Remarks in Surgery, vol. ii. p. 174. by Benjamin Gooch.

along the course of the calculous concretions ; in turning them out, either with a scoop or small forceps ; and in dressing the wound properly, so as to induce a firm adhesion of the parts beneath, before the external teguments are permitted to heal.

In females, the urethra is so short, and dilates so readily, that small stones seldom stop in it : They are most commonly carried off by the flow of urine that brings them into it ; but when they happen to fix in it, they are easily turned out, merely by insinuating the end of a blunt probe behind them, and then pulling them forward : Or, when this does not succeed, it may always be done with safety, by laying open the extremity of the urethra with a scalpel, so far as to admit of the introduction of small forceps.

CHAPTER XXX.

Of Incontinence of URINE.

INCONTINENCE of urine may arise from various causes; but being frequently connected with calculous complaints, and in some instances the consequence of the operation of lithotomy, I am hence induced to speak of it here.

1. It may arise from irritation about the neck of the bladder, produced by the

friction of stones contained in it. Thus we know, that inability to retain urine is a frequent symptom of stone in the bladder; and we cannot suppose it to proceed from any other cause than the constant stimulus communicated by the stone to the coats of the bladder. For, were it always produced, as has been supposed, by a total loss of power in the sphincter vesicæ, the disease would seldom or never admit of a cure. But we know well, that incontinence of urine, depending upon a stone in the bladder, is often removed entirely by the operation of lithotomy: And we likewise know, that it is often much relieved, even when the stone remains in the bladder, by the use of those remedies that most effectually remove irritability; particularly by a plentiful use of mucilaginous drinks, and a free use of opiates. By a continued use of these remedies, indeed, this variety of the disease is commonly removed with more certainty than by any other means, extraction of the stone excepted; which,

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when these fail, is to be kept in view as the only resource upon which we are to depend.

2. An incontinence of urine is a frequent effect of palsy; and it would appear, that the sphincter of the bladder sometimes loses its contractile power, while the natural tone of the muscle termed *Detrusor Urinæ*, which constitutes the chief part of the body of the bladder, remains entire. In this variety of the disease, the obstinacy of the paralytic affection with which the constitution is attacked, commonly renders fruitless every attempt to remove it. But the most obvious remedies to be employed for it, are, tonics, particularly Peruvian bark, chalybeates, and especially the cold bath general and local. The local application of cold to the perinæum has frequently a powerful influence: Cloths wet with vinegar and cold water, or with a strong solution of *saccharum saturni* in vinegar, prove sometimes useful; but the most effectual method of applying cold, is

by dashing water directly from the fountain upon the loins, perinæum, and fundament.

3. Incontinence of urine is not an unfrequent effect of laceration in the operation of lithotomy in male subjects; and in the same operation, and by violence done to the parts in delivery, in females. It ought, however, to be remembered, when in the lateral operation much laceration is produced, that in general it proceeds from the muscles not having been divided with sufficient freedom by the knife: And accordingly, except in cases of large stones, incontinence of urine seldom succeeds to this operation when properly performed.

As the disease in this case depends upon nearly the same cause as the one last mentioned, namely, on a loss of power in the retaining parts, the same remedies are proper; and by due perseverance, particularly in the use of cold bathing, many are at last very completely cured of
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this variety of the disease. But it frequently happens, in all varieties of the disease, that no relief is obtained from any remedy whatever; in which case, it becomes an object of importance to prevent the urine from incommoding the patient, which it never fails to do, if means are not employed to guard against it.

When it proceeds from either of the causes last mentioned, namely, from a paralysis of the sphincter of the bladder, or from laceration, compression of the urethra answers the purpose; as the pressure can be so modified as to be applied and removed at pleasure. Nuck invented the first instrument for this purpose of which any description is given. The Jugum, or Yoke, as it is termed, Plate LXXVIII. fig. 1. is an improvement upon this; and, when properly fitted, it answers the purpose exceedingly well. When lined with quilted silk or velvet, it fits easily on the penis, and by means of the screw,

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the pressure can be made sufficiently tight. For women another invention is necessary, as the pressure must be applied through the vagina. Pessaries of resina elastica, and of sponge, have been proposed for it, but those of ivory or lignum vitæ answer better: In Plate LXXIV. are represented pessaries of different kinds.

Pessaries should all be finely polished, and dipped in oil immediately before being introduced. After being passed into the vagina, the pessary should be placed directly across, so as to press with as much effect as possible against the urethra.

This method of obviating the inconveniences arising from incontinence of urine, by pressure, is not, however, applicable when the disease proceeds from irritation about the neck of the bladder; for the continual desire to pass water, with which patients in such circumstances are tormented, renders every attempt to suppress a complete discharge of it totally

tally inadmissible. It is therefore a point of the first importance to distinguish between the different causes of the disease; for it is obvious that a remedy that may be well calculated for the one variety may prove highly prejudicial in others.

Whenever it is found that pressure upon the urethra is improper, or that it does not answer, relief may commonly be obtained from a machine properly fitted to serve as a reservoir for the urine. The instruments formerly referred to, represented in Plates LI. and LXXVIII. have been often used, and commonly with much advantage. They should be made so as to apply as closely as possible to the parts on which they rest; and when properly fixed to a circular bandage round the body, they remain sufficiently firm, and at the same time admit of every necessary change of posture in ordinary exertions of the body. The last of these instruments, namely, the one delineated
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in Plate LXXVIII. fig. 2. proves useful only in men; but the other, Plate LI. fig. 2. may be employed for women also.

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CHAPTER XXXI.

Of Suppression of URINE.

THE subject of the preceding chapter, namely, Incontinence of Urine, proves always troublesome and inconvenient; but the disease that we are now to consider, proves, in every instance, very alarming, and often ends in the death of the patient *.

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* It is that variety of the disease to which I allude, in which the urine is collected in the bladder, but which the patient is unable to discharge. When suppression takes place from a morbid state of the kidneys, a variety of the disease is produced, -that no chirurgical operation can relieve; so that it does not fall to be considered here.

A suppression of urine may be the effect of various causes, and in the method of cure a nice discrimination of these is proper.

1. In the preceding chapter we have seen, that incontinence of urine is often produced by the sphincter of the bladder becoming paralytic, while the detrusor urinæ still retains its power of contraction. In like manner, a suppression of urine frequently occurs in palsy, and seems to proceed from loss of power in the body of the bladder, while the sphincter still preserves its usual power of retention.

Although this variety of the disease is often connected with palsy of all the under part of the body, yet it is frequently induced by the pernicious custom of remaining too long, especially when drinking freely of diuretic liquors, without voiding urine; by which means, the bladder is sometimes so far overdistended, that it loses entirely all power of contraction.

The catheter proves here commonly a very certain remedy, and it should always be employed as soon as it is found that the urine collected in the bladder cannot be passed. For although the introduction of this instrument should never be advised where it can with safety be avoided, yet as in the circumstances we are now considering, delay never fails to prove dangerous, the urine should always be drawn off as soon as the stoppage excites much uneasiness. At the commencement of the disease it is for the most part easily done; while long delay, by exciting swelling and inflammation about the neck of the bladder, never fails to render it both more difficult and more painful, and in some instances even impossible to pass the catheter. The method of passing the catheter, both in the male and female subject, is the same with the operation of founding for the stone, already described in Chapter XXIX. Section II.

2. A suppression of urine is frequently produced in the last months of pregnancy,
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by the pressure of the uterus upon the neck of the bladder. So completely indeed is the urine sometimes obstructed by this, that not a single drop can be discharged but with the aid of a catheter: And as this instrument is in females commonly introduced with ease, it should always be employed as soon as the urine cannot be otherwise voided. Delay in using the catheter is often the cause of much distress. In different instances, the bladder has from this cause alone been distended to such a degree as to lose all power of contraction; and in a few cases, it has even burst entirely: We should not therefore hesitate to advise the catheter to be employed, on finding that the bladder is in any degree distended beyond its usual size.

3. Tumors in the vagina and neighbouring parts, when they become large, are apt to compress the urethra so much as to induce a total suppression of urine; and a prolapsus uteri is often attended with the same effect.

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The method of treatment best calculated for removing a prolapsus uteri, as likewise the means of cure commonly employed in tumors in the vagina, will be the subjects of different chapters; only it must be remembered, that till these views are accomplished, the urine should in the mean time be regularly drawn off with the catheter, whenever it is collected in large quantities.

The very irritable state of the parts about the neck of the bladder, that often prevails in suppression of urine, renders it necessary in some instances to use the catheter often. Instead of this, some practitioners have advised the common catheter to be allowed to remain in the bladder a considerable time at once, so as to admit of the urine being discharged as soon as it is secreted: But this is a practice that ought not to be admitted; for the irritation arising from a long continuance of this instrument in the bladder, commonly does more harm than we ever experience from a frequent use of it. When

it is wished, however, to allow a catheter to remain in the bladder, either for this purpose, or for wounds in the urethra, the hard silver tubes in common use ought not to be employed; those prepared with *Resina Elastica*, answer the intention much better, and I have found by experience, that they do not dissolve in the urine: In one case a tube of this resin was kept in the bladder twenty-two days without being hurt by the urine.

4. A stoppage to the flow of urine is not an unfrequent effect of an enlarged state of the prostate gland, and of obstructions in the urethra in virulent gonorrhœa. The treatment best suited to these affections will form the subject of part of the ensuing chapter.

Suppression of urine induced by stones impacted in the urethra, has been already considered in Section IX. of Chap. XXIX. where the remedy was pointed out.

5. But the most alarming variety of the disease is that which proceeds from inflammation about the neck of the bladder,

der, inducing pain and swelling to such a degree, as often make it impossible to pass the catheter.

Suppression of urine from this cause is not an unfrequent consequence of inflammation in gonorrhœa proceeding backwards along the urethra : It is sometimes, although not often, induced, by an unguarded use of stimulating injections ; and as the bladder is equally liable with other parts of the body to the influence of every cause that excites inflammation, whatever excites inflammation in other parts will very readily do so here.

In whatever way inflammation may be induced, the means of cure should be nearly the same : Blood should be discharged from the arm in quantities proportioned to the strength of the patient, and a considerable number of leeches should be applied upon the perinæum as near as possible to the seat of the disease, and allowed to bleed freely. Opiates should be given in large doses ; injections of warm water or milk, whether by themselves or

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combined

combined with opiates, should be repeatedly thrown into the rectum; and the whole body should be immersed in the warm bath. By these means, when the parts affected are not violently inflamed, the suppression will in some instances be removed before any distressful symptoms take place. But when these remedies do not prove effectual; when the bladder becomes painfully distended; and when every attempt to introduce the catheter has failed, some other means of relief should be employed. In such circumstances, puncturing the bladder is the only remedy on which we can with certainty depend: Being an operation of some nicety and hazard, arising not so much from the difficulty of doing it, as from the consequences that sometimes result from it, and the strict confinement that for a considerable time it entails upon the patient, it ought never to be advised till the other remedies I have mentioned have been tried in vain; at the same time, how-

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it should never be long delayed after our other means of relief have been found to fail.

The bladder may be punctured in various ways : It may be done a little above the pubes : The membranous part of the urethra, and prostate gland may be cut, and an opening made in the neck of the bladder. An opening may be made from the perinæum, directly into the body of the bladder ; and a puncture may be made in the back part of the bladder by passing a trocar into it from the rectum. As the method of puncturing the bladder, after dividing the membranous part of the urethra and prostate gland, is obviously more hazardous than any of the others, it is now very deservedly laid aside, so that it is not necessary to speak of it farther. We have therefore only to consider the other three modes of operating.

In puncturing the bladder above the pubes, we are directed by authors, first to make an incision, two inches in length, through the common teguments and muscles,

cles, and then to perforate the bladder with a trocar. But there is no necessity for this extensive division of the teguments and muscles; for the operation may be done with equal safety, and with much less pain to the patient, by pushing a trocar at once through the skin, muscles, and bladder; and it may be entered any where from the height of half an inch to an inch and half above the pubes, and half an inch or thereby on either side of the linea alba. Some advise the trocar to be passed obliquely downwards, with a view to prevent the back part of the bladder from being hurt by it; but we act with more safety, and guard with more certainty against this injury to the bladder, by making use of a short canula, and passing the trocar nearly in a horizontal direction; for, in passing it obliquely down towards the centre of the pelvis, the bladder, on being left empty, would, in a great proportion of cases, be apt to slip off from the end of it, by which the urine would be extravasated, and lodge

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in the contiguous parts. As soon as the trocar has pierced the bladder, the stilette should be withdrawn, and the canula secured in its situation with pieces of ribbon or tape connected with it, tied to a circular bandage, passed round the body.

The length of the canula used in this operation is, I may remark, a point of the first importance, and merits particular attention ; for much inconvenience would arise from its being too short, while a long canula, as I have already observed, is very apt to injure the back part of the bladder. Of this we have an instance on record, in which the end of the canula was found, after death, to have penetrated not only the back part of the bladder, but even the rectum*.

In corpulent people, the canula may require to be two, three, or even more inches in length, according to the quantity of fat between the skin and bladder ; but in thin patients, I know from
Q4 experience,

* Vid. Sharpe's Operations of Surgery, chap. XV.

experience, that an inch and half is sufficient.

The canula, it must be remembered, is to be retained in its situation till the cause of the obstruction is so far removed, that the patient can pass urine in the usual manner; but it has been very properly remarked *, that a canula cannot be kept above ten or fourteen days in the bladder, but with the risk of contracting a calculous crust, that renders its extraction both difficult and painful. The canula, therefore, should be taken out and cleaned, from time to time. This has commonly been done, by passing a firm probe of a sufficient thickness through it into the bladder, upon which the canula is again returned, on being cleared of the incrustation. Instead of a probe, however, I have employed a tube that answers better. This tube is made to fit the diameter of the canula exactly, but at the same time to pass easily through it; and it has this advantage over a probe, that in the event

* Vid. Critical Enquiry, &c. by Mr Sharpe, chap. IV,

event of its proving difficult to return the canula of the trocar, as sometimes is the case, the tube may be retained; and being nearly of the same diameter, it answers the purpose equally well. Of this tube, and the mode of applying it, I have given a delineation and description in Plate LX. and in Plate LXI. I have delineated a very neat apparatus for puncturing the bladder above the pubes, by Dr Monro.

In puncturing the bladder from the perinæum, the patient should be placed upon his back on a firm table; and his thighs being separated, and properly secured by assistants, an incision should be made of an inch and half in length, beginning at the commencement of the membranous part of the urethra, and proceeding towards the anus, in a line parallel to, but at least half an inch distant from the rapha perinæi. In this manner the skin and cellular substance should be freely divided; which puts it in the power of the operator not only to introduce the trocar with
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more ease, but to avoid the urethra with more certainty than he otherwise could do.

This being done, as the bladder is always much distended when this operation is necessary, it is easily distinguished with the finger at the bottom of the wound: But, whether it is felt by the finger or not, we should not hesitate to push in the trocar a little above, and to the left of the prostate gland, which, when the parts have been freely divided, is easily discovered; and if the point of the trocar is directed a little upwards, and outward towards the pubes, there can be no danger of hurting either the ureters or vasa deferentia, which some have been afraid of in this operation; and at the same time there must be an absolute certainty, if the trocar is carried to a sufficient depth, of its reaching the bladder.

It has been alleged, and with some reason, that in this part of the operation the surgeon must be at a loss to know when the instrument has reached the bladder;
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and several inventions have been proposed, to obviate this inconvenience. In Plate LVIII. fig. 5. is represented a very simple contrivance for this purpose: It consists of a trocar, with a canula of the usual form, and a deep groove in the stilette, so that urine begins to flow along the groove, immediately on the instrument having entered the bladder. As soon, therefore, as in this manner we know that the trocar has passed to a sufficient depth, the stilette should be withdrawn; when the canula should be secured by two pieces of tape, connected with two rings upon its brim, being firmly tied to a circular bandage round the body: And if one of these tapes is tied behind immediately above the sacrum, and the other directly above the pubes, the canula will not be easily displaced.

It is equally necessary here as when the operation is done above the pubes, to change the canula, or at least to clean it from time to time; and in this situation
too,

too, so long as a canula is employed, the urine may be retained and drawn off at pleasure, by having a plug of cork adapted to it.

In perforating the bladder from the rectum, the patient should be placed upon his back, and secured with assistants in the manner already pointed out: The surgeon now inserts the fore finger of his left hand into the rectum, and having carried the point of it about an inch higher than the prostate gland, where the bladder in this distended state of it is easily felt, a curved trocar about two inches and a half in length, should be passed along the finger, and pushed at this prominent part of the bladder, in an oblique direction upwards till it reaches the urine. In this situation, the canula must either be retained by being fixed with pieces of small tape to a circular bandage round the body, or a tube of *resina elastica* should be inserted through it, and left in the opening till the urine passes off by the urethra.

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This operation has now been frequently performed, but it is liable to so many important objections, that I do not suppose that it will ever be generally adopted. It is easily performed, but this is almost the only circumstance that tends to recommend it. The chief objections to it are, the risk incurred by it, of wounding either the ureters, vasa deferentia, or vesiculæ feminales, while, at the same time, it forms a passage, by which the fæces may find access to the cavity of the bladder, that would either soon end in the death of the patient, or leave him in a state of very miserable existence. Much irritation and distress must also ensue, from a canula being left in the rectum during the cure, that is, till the urine passes off by the natural conduit of the urethra, which, in some instances, does not happen in less than a year or two, while in others the stoppage continues during life. Mr Weldon, who has written an ingenious treatise on this subject, indeed says, that the canula may be withdrawn soon after the operation, and the
urine

urine allowed to pass off by the opening.
 * But, besides the very uncomfortable state to which this would reduce the patient, by having his urine at all times passing off by the rectum; the opening would probably heal from time to time, by which the operation might be frequently to renew.

I have thus described the different modes that have been proposed of puncturing the bladder. In appreciating the merits of each, I was at one time of opinion, that doing it from the perinæum was the best; and in the former editions of this work, I freely said so. I now, however, think it right to observe, that farther experience has convinced me that I was wrong. Every method of performing this nice operation, is attended with difficulties. I have already enumerated those that chiefly apply to the mode of doing it from the rectum. To the perforation above the pubes, it is objected, that the cavity of the abdomen may be pierced

* Vide Observations on the different modes of puncturing the bladder, by Walter Weldon, surgeon.

pierced with the trocar ; that the bladder may be injured, by being suspended for a considerable time upon the canula ; that it may even slip off from the end of the canula, by which all the urine will escape, and lodge in the pelvis ; that the end of the canula may injure the back part of the bladder ; and that the urine, insinuating into the cellular substance of the contiguous parts, may terminate in various distressful symptoms.

It may be observed, however, in answer to these difficulties, that where the operation is properly conducted, few or none of them ever occur. It can seldom or never be necessary to puncture the bladder, till it is so much distended with urine, as to be considerably raised above the pubes ; in which situation, there is no risk of pushing the trocar into the abdomen. A suppression of urine may no doubt happen, where the bladder, by disease, is so much contracted, that this degree of distention cannot, consistent with the safety of the patient, be permitted.

I conclude, however, that this is uncommon, as I have never yet met with it; and where it does take place, the diseased state of the bladder will give little or no chance to the operation, wherever it may be performed. I know from experience, that the bladder is not apt to be hurt by being suspended on the canula; and I conclude that this may, in some measure, happen, from those attachments that commonly take place in this disease, between the bladder and contiguous parts, as the effect of the inflammation, with which a suppression of urine is for the most part attended. Those adhesions of the bladder to the contiguous parts, may also in some measure tend to prevent the bladder from slipping off from the canula; but this accident can never possibly happen, if the trocar is not introduced with too much obliquity downwards. Neither will the back part of the bladder be hurt by the canula, if the directions I have given, in regard to the length of it, are kept in view, and if the blunt silver stopper,

Plate LX. fig. 3. is always kept in it, except when the patient is voiding urine.

That distressful symptoms may ensue, from the urine finding access to the contiguous cellular substance, none will doubt, but I have now much reason to think that it is an uncommon occurrence in this operation.

In perforating from the perinæum, to which at one time I gave the preference, the urine is still more apt to escape from the wound, into the contiguous cellular substance; although this is by no means the most important objection to the operation being done in that situation. The chief danger here, arises from the near contiguity of very important parts, the urethra, prostate gland, ureters, vasæ deferentiæ, and vesiculæ seminales, which being all near the neck of the bladder, and therefore apt to inflame, whenever the urine is long suppressed, they must necessarily be more severely injured, by the trocar passing near them, and by their being freely exposed to the air, by the

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deep incision in the previous steps of the operation, than the upper part of the bladder can possibly be, in perforating above the pubes, and accordingly more danger is found to attend it.

I am therefore of opinion, on a comparative view of the advantages and disadvantages of these several operations, that puncturing the bladder above the pubes is the best. I have only farther to observe, before leaving the subject, that in whatever way the operation is done, it should not be long postponed after the bladder becomes painfully distended: I have often indeed been led to think that more danger has ensued from delay in this situation, by which the bladder has appeared to be entirely deprived of its tone, than we almost ever meet with from the most untoward occurrence in any of these modes of operating.

In the operation of lithotomy in females, I mentioned reasons that appear to be conclusive against the method of cutting into the bladder from the vagina;
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but they do not apply with equal force against the propriety of puncturing the bladder in this part. On the contrary, whenever there is cause for performing this operation in women, it cannot be done in any other way, either with such ease or certainty, as from the vagina. When the bladder is much distended with urine, it is easily discovered by the finger in the vagina; and from thence it may with safety be pierced with a trocar. The fore-finger of the left-hand being passed into the vagina, the point of the trocar should be conducted upon it, and pushed through the vagina into that part of the bladder first discovered by the finger; for here the ureters run no risk of being wounded, which farther back they certainly would do. The trocar being freely passed into the bladder, and the urine all evacuated, the canula should be left in its place, and continued as long as the cause subsists by which the suppression was produced. That the tube may be firmly secured, it should be of a suffi-

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cient length for passing out at the vagina, and to admit of its being tied to the T-bandage, with tapes attached to it.

I think it here, however, proper to observe, that in whatever way the bladder is punctured, and whether in male or female patients, if tubes of silver irritate and excite pain, as they are very apt to do, that this may in most instances be prevented, by leaving in the passage a tube of elastic resin.

CHAPTER XXXII.

Obstructions in the URETHRA.

IN the preceding section, when treating of the causes of suppression of urine, obstructions produced by claps, of which caruncles are supposed to be the most frequent, were spoken of as the most frequent and most remarkable.

But although I have particularly mentioned the term Caruncle, by which is meant a fleshy excrescence arising from the membrane of the urethra, I do not wish it to be supposed that I consider it to be a frequent occurrence. That such excrescences are sometimes met with towards the

extremity of the yard, there is no reason to doubt; but as I have often dissected these parts, in patients who had long laboured under symptoms supposed to proceed from caruncles in the back-part of the urethra, and as caruncles were not discovered in any of them, I am therefore clearly of opinion that their existence in the more remote parts of the urethra is very uncommon. I have often observed this kind of production, within a quarter of an inch of the extremity of the urethra, especially where the glans and prepuce have been covered with wart-like excrescences of a similar nature: But from having never, even in cases of this kind, found them spread farther up the canal, although it is not a proof that they never occur in other parts of it, yet this, together with some observations of a similar nature by Dionis, Saviard, Mr Petit, and others, is sufficient authority for the opinion I have advanced, that caruncles in the more remote parts of the urethra are rarely met with. Daran indeed

deed often speaks of them; and he no doubt had more practice in diseases of this class than perhaps ever fell to the share of any other individual: But if his works are read with attention, it will appear that his detail is very inaccurate; for he evidently confounds other causes of obstruction, particularly callous strictures and cicatrices of old ulcers, with, and mistakes them for, caruncles.

Practitioners in former times, as well as many in more late periods, have doubted so little of the frequent occurrence of caruncles, that almost every instance of obstructed urethra succeeding to a clap has been attributed to this cause. What I have here set forth will tend to set this however in a different view; and I shall now proceed to enumerate the different causes by which obstructions in the urethra may be produced.

1. Although I have said that caruncles are rarely met with in the superior part of the urethra, yet they sometimes form towards the extremity of this canal: They

must therefore be mentioned as one cause of these obstructions. I must again observe, however, that where caruncles, or carnosities as they are sometimes termed, are met with, they are always of the same nature with those warty excrescences that frequently form upon the prepuce and glans as a consequence of gonorrhœa.

2. Ulcers in different parts of the urethra have been known to produce very complete obstructions.

On opening the bodies of those who at the time of death laboured under gonorrhœa, it has commonly been found that no ulceration could be discovered; and this gave rise to the opinion that ulcers of the urethra never take place in gonorrhœa. We now know indeed that very great quantities of matter, even of a purulent kind, may be furnished by parts merely inflamed, and not in a state of ulceration. But we also know, that parts remaining for any considerable length of time so highly inflamed as to furnish much pus, are very apt to become ulcerated;
and

and if this happens in other parts of the body, we may conclude that the same cause will induce the same effects in the urethra. Accordingly, there is no reason to doubt of ulcers arising in the urethra from inflammation alone; but it is likewise certain, that they are sometimes met with in the urethra from the same cause by which chancres are produced in the glans, namely, from the mechanical effects of the venereal poison, independent of the intervention of any degree of inflammation.

The excretory ducts of the different glands in the urethra, particularly of the prostate gland, as also the ducts of the vesiculæ seminales, and the other parts about the verumontanum, have commonly been supposed to be particularly obnoxious to the effects of the venereal virus; and ulcerations are accordingly said to be more frequent in these parts than in others. The result of my observation, however, has been, that ulcers seldom occur in any part of the urethra, but more frequently towards the extremity
of

of the urethra than in other parts of it, and that they rarely form farther back than an inch or so from the point of the yard.

3. Dissection has shown that a mere contracted state of the urethra is to be considered as the most frequent cause of obstruction. In some, the stricture is confined to one point, while in others different parts of the passage are diseased. At one period, I was induced to think that strictures in the urethra were more frequently produced by ulceration than in any other way; but I have now reason to think, that they proceed more frequently from that thickened state of the membrane of the urethra that gonorrhœa is apt to excite.

Astringent injections are mentioned by many as a frequent cause of strictures. Irritating injections, when improperly applied to parts already in a state of inflammation, may no doubt do harm; and, by increasing the inflammatory state of the urethra, may in this manner produce

strictures: But this is not the fault of the remedy, but of the improper use of it. Similar objections might with equal reason be adduced against the use of every medicine with which we are acquainted; for no remedy is more safe in its operation, or more effectual in the cure, than astringent injections in gonorrhœa. Obstinate claps indeed are often cured by injections that cannot be removed in any other way.

4. Tumors in the cellular substance surrounding the urethra, or in any of the glands connected with it, very frequently produce obstructions in the course of it: And inflammation, whether at first induced by gonorrhœa or in any other way, when it terminates in suppuration, must be apt to induce them. In such cases, indeed, as soon as the matter collected in the abscess is discharged, the obstruction produced by it is in general removed: In some instances, however, this does not happen; for in different cases I have found, that the compression
produced

produced by the tumor has induced such firm adhesion between the sides of the urethra, as to obliterate the canal entirely. In which case, as a total stop is put to the natural discharge of urine, it bursts out in the perinæum, where one or more openings, communicating with the urethra, are found between the seat of the disease and the prostate gland.

5. Of all the causes of obstruction, none are so frequent as a fulness or enlargement of the corpus spongiosum urethræ. On dissecting the penis of such as have laboured long under obstructions, a partial enlargement or thickening of the substance of the urethra often appears to be the cause, and it frequently proceeds so far as to obstruct the passage entirely.

In some the stoppage is confined to a particular spot: In others it is of considerable extent; while not unfrequently it attacks different parts of the canal, leaving intermediate parts perfectly sound.

6. Having thus enumerated the causes that most frequently produce obstructions

in the urethra, I shall now endeavour to point out the treatment best calculated for their removal.

When the obstruction is produced by the pressure of a tumor, our practice must depend on the kind and nature of the tumor. Accordingly, when the tumors are hard and indolent, they ought to be extirpated when it can be done with safety. But although this may be done when they do not penetrate deep, yet when the prostate gland, or any of the parts about the neck of the bladder, are found to be enlarged, the removal of these cannot possibly be attempted. In such desperate cases, cicuta has been often used; but seldom, I believe, with much advantage. In an ulcerated state of the parts, a plentiful use of uva ursi has been known to give relief, and some advantage has occasionally been derived from a gentle course of mercury. The effect, however, of mercury in all affections of this kind is by no means certain; and in the distress that this variety of the disease excites,

cites, we are frequently reduced to the necessity of trusting entirely to the relief obtained from opiates, and from a plentiful use of mucilaginous drinks.

When, again, the tumors proceed from inflammation, if they are not soon discussed, the most effectual means should be employed for bringing them to suppuration.

These have already been pointed out *. As soon as the formation of matter is thus accomplished, it ought to be discharged. In other parts of the body, when an inflammatory tumor is likely to terminate in suppuration, we consider it as good practice not to open the abscess till pus is thoroughly formed; but in this situation, as much distress would ensue from delay, the abscess should be opened as soon as there is cause to imagine that the pressure upon the urethra would be diminished by doing so; and this must always be the case when a fluctuation of matter is evidently discovered. In all such cases, we
remove

* Vid. Chapter I.

remove the obstruction in the urethra with more certainty by discharging the matter contained in the abscess than by any other means. If, on laying the collection open, however, it is found that the stoppage in the urethra is not removed, bougies should be immediately employed. By passing a bougie of a proper size along the urethra, and allowing it to remain for two or three hours daily, any stricture produced by the pressure of the abscess will soon be entirely removed.

It sometimes happens, where abscesses in this situation have been of long duration, that the urine bursts into the cellular membrane of the perinæum and other contiguous parts, and from thence forms one or more external openings. One of the most distressful situations is in this manner induced, to which the human body is liable, a disease of which we shall speak more particularly in the Chapter on the fistula in perinæo. In the other cases of obstructed urine, proceeding from caruncles when they

they happen to occur; from ulcers, and the cicatrices that they produce; from stricture and contraction of the urethra; or from an enlarged and thickened state of the corpus spongiosum urethræ, we depend almost entirely on a proper application of bougies, a remedy that proves chiefly useful by its mechanical action on the obstructed part. It has been alleged indeed by many, particularly by Mr Daran and Mr Sharpe, that, in removing caruncles and other causes of obstruction, bougies prove more useful by what they term their Suppurative quality, than by any other property: By which they mean to say, that bougies may be composed of such materials as will induce a suppuration upon the caruncles to which they are applied; and that this suppuration, if continued for a sufficient length of time, will ultimately destroy all the diseased parts *.

This

* For Mr Daran's account of this matter, see his *Treatise on Diseases of the Urethra*: And Mr Sharpe's account of

This idea, although founded on inaccuracy, continues with many still to prevail: Little argument, however, is required to shew that bougies act chiefly by their mechanical pressure, and not by the suppuration which they excite. Among other reasons that might be given as proofs of this, I shall only mention the following.

1. Those who allege that bougies prove useful only by inducing suppuration, are obliged to affirm that obstructions to the passage of urine arise most frequently from

of it may be seen in his *Critical Enquiry*, chap. vi. Although Mr Sharpe is clearly of opinion, that the principal advantage derived from bougies proceeds from their influence in inducing suppuration, yet, whenever he argues on this with accuracy, he is obliged to acknowledge, that by their pressure alone they prove useful: For he says, 'That though I have a great opinion of the good effects produced by the suppuration, yet I believe also, that bougies operate by distending the urethra; and I will go so far as to give it as my judgment, that even the cures done by Mr Daran are wrought partly by distention, and partly by suppuration; though he himself ascribes them to suppuration only.' Vide page 171. fourth edition, loc. cit.

from caruncles in the urethra; and that the suppuration produced by the bougies, tends to destroy, or as it were to dissolve, them. Although these excrescences may sometimes prove the cause of obstructions, yet, as I have already endeavoured to show, they are very rarely met with. It must therefore follow, if this idea of the cause of the disease is ill founded, that the supposed *modus operandi* of the remedies employed in it must likewise be erroneous; for every practitioner who has attended much to this branch of business, must acknowledge, that bougies prove much more frequently useful than the cause upon which they have been supposed chiefly to operate is found to exist. Indeed, the general utility of bougies in obstructions of the urethra, must be acknowledged by all who have used them, while scarcely any advantage is derived from any other remedy.

2. But although we should allow that caruncles are frequently formed in the urethra, we cannot admit that suppura-

tion induced upon them would have much influence in removing them.

We know, that, in other parts of the body, warts and other hard excrescences cannot be carried off merely by matter being formed upon them; and we cannot suppose that in this there is much difference between the same disorder in the urethra, and in other parts of the body.

3. It has been said, that these bougies, at the same time that they act by inducing suppuration, have likewise some influence as escharotics; and that many of Mr Daran's bougies, the composition of which was kept secret, were evidently possessed of this property.—Mr Daran, in order to render the operation of his remedy as mysterious as possible, did indeed allege, that his bougies were endowed with many virtues: But no candid practitioner will say, that bougies possessed of a degree of causticity sufficient to destroy warts, can with propriety be introduced into the urethra; for, if of such a strength as to corrode these excrescences,

they would necessarily injure the whole course of the urethra to which they are applied.—Indeed, the mildest materials we can employ frequently stimulate too much: For, upon withdrawing any bougie that has remained long in the urethra, it is almost always found covered with purulent matter. It is this indeed I imagine, that first suggested the idea of bougies acting by inducing suppuration; which, however, is to be considered only as a necessary effect of a stimulus applied to a sensible membrane, being in no respect essential to the cure of the disease for which the bougie was used.

4. But without having recourse to the suppurative or escharotic effects of bougies, the advantages commonly derived from them, may, as I have already endeavoured to show, be easily explained upon the principle of mechanical pressure alone.

I have thus thought it proper to consider the action of bougies with minuteness; for till the opinion is exploded of me-

licated bougies, as they are termed, being necessary, much mischief may be done, by forming them of irritating or even of escharotic materials, as is sometimes the case, instead of rendering their composition mild and inoffensive, as in every instance it ought to be.

The opinion that I have endeavoured to establish being admitted, namely, that bougies should operate solely by mechanical pressure, it must necessarily follow, that, in the formation of bougies, much will depend on their being of a proper consistence; neither too hard nor too soft. When too soft and compressible, they cannot act with advantage against the obstructing cause, and against which pressure is intended to be applied; and when too hard, they are apt to crack, and are neither introduced into nor retained in the urethra with so much ease as when formed of a proper consistence: Bougies ought likewise to have a smooth polished surface, to facilitate their introduction; and lastly, they ought, as I have already

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remarked,

remarked, to be composed of very mild materials, so that they may excite as little irritation as possible.

Various formulæ have been given for bougie plasters; and of these the following are perhaps the best.

No. 1. R. Emplast. Diachyl. simp. ℥iv.
Cer. puriss. ℥iss.
Ol. Oliv. opt. ℥iii,

No. 2. R. Emplast. commun.
Spermat. Cæt. aa ℥iv.
Ol. Oliv. opt. ℥ss.
Minii, ℥ss. M.

No. 3. R. Emplast. commun. ℥vi.
Ceræ flavæ puriss.
Spermat. Cæt. aa ℥ii.
Ol. Oliv. opt. ℥i.
Antimon. crud. pptt. ℥ss. M. S. A.

Any of these prescriptions afford a good composition for bougies. They require to be slowly melted, and the different articles

ticles to be well mixed together. No. 1. is the simplest, and perhaps the best; the red lead in No. 2. and antimony in No. 3. being added chiefly for the purpose of affording a variety of colour. No. 4. is a composition for bougies recommended by Mr John Hunter*; and No. 5. by Mr Sharpe†.

No. 4. Take oil of olives, three pints;
Bees wax, one pound;
Red lead, one pound and a half.

Let them be boiled together on a slow fire for six hours.

No. 5. *R.* Diachyl. cum pice Burgund.
 ℥ii.
 Argent. viv. *℥i.*
 Antimon. crud. *pp^{tt}. 3℥s.*

The quicksilver to be previously dissolved in balsam of sulphur, or in honey, and

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added

* See Treatise on the Venereal Disease, p. 137.

† See Critical Enquiry by Samuel Sharpe, F. R. S.

added to the plaster when melted in a moderate heat.

Any of these compositions, when boiled to a proper consistence, will answer for the formation of bougies, which is done in the following manner: While the liquid still continues warm, let a piece of fine old linen be dipped in it, taking care with a spatula to cover the whole of it. If the melted liquor be of a proper heat, no more of the plaster will adhere to the linen than is necessary; but as air bubbles are apt to arise and produce inequalities on the surface of the cloth, the spatula made use of should be somewhat warmer than the plaster, and by means of it the whole should be made as smooth as possible. The plaster might indeed be spread entirely with the spatula; but this is not only attended with more trouble, but it does not cover the cloth with sufficient equality.

The cloth being sufficiently cold, may be immediately formed into bougies, and
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the whole should, in the first place, be cut into the number that is meant to be made. The most exact method of doing this is by means of a sharp-pointed knife, directed by a rule. The pieces should be eleven inches in length for bougies of a full size; but they should likewise be kept of all the variety of lengths for strictures of different heights in the urethra.

A variety of directions have been given for the form of bougies. Some advise them to be made nearly of an equal thickness to within an inch of their smallest end, and to taper from that to the point, while a great proportion of them are made to taper to within an inch or two of the point, and the rest of them are cylindrical. I once thought that this last form of bougie was the best; but after a long course of experience in this branch of business, I am now convinced, that bougies, which taper equally from one end to the other, are the best, and that this form answers equally well for every
variety

variety of size. They are introduced more easily, and with less pain than any of the others; the linen should therefore be cut in such a manner as to give this form to the bougies. When rightly spread, and the linen sufficiently fine, a well shaped bougie will be formed of a slip of about five-eighths of an inch broad at its largest end, and somewhat more than three-eighths at the smallest end. This forms a bougie of a middle size; for particular purposes they must be considerably larger, and for others not so large by a great deal.

The slips of linen are now to be rolled up as neatly as possible with the fingers; and in order to give them a smooth polished surface, they should be smartly rolled between a piece of smooth hard timber and a plate of fine polished marble: This being continued till the whole are rendered perfectly smooth and firm, and their points being properly rounded in order to facilitate introduction, they are in this state to be kept for use.

These

These directions will convey an idea of the method of preparing bougies, but no surgeon can ever become so expert in forming them as artists daily accustomed to prepare them in large quantities. I must here, however, remark, that bougies, properly prepared with *resina elastica*, are preferable in many circumstances to such as are made with any kind of plaster. They not only prove much more durable, but more force can be employed with them, and as they do not break or crack by continuing in the urethra, they remain in it with less pain and inconvenience than any other bougie that has yet been invented.

Cat-gut has frequently been used as a bougie; but after various trials being given to it, I do not find that it answers the purpose; it cannot be made sufficiently smooth; and it sometimes swells so much as to excite a good deal of irritation; and lead, which was one of the first articles used for bougies, is so firm
that

that it always creates much pain, while at the same time it is so apt to break, that different instances having occurred of this, it has now been long laid aside.

We come now to the application of the bougie.—A bougie, must be chosen, adapted to the size of the passage through which it is to pass, and well covered with fine oil: The penis being firmly grasped and extended with one hand, the end of the bougie must be inserted into the urethra with the other; and being pushed forward with caution, it is in this manner to be carried on till it meets with the cause of obstruction; when, if a moderate force makes it pass, our object is so far accomplished: But if, after different attempts, it cannot be easily carried forward, it should be immediately withdrawn; and at next trial, which, in order to avoid any risk of inflammation, should not be made till the following day at soonest, a bougie with a smaller point should be employed.

Much

Much nicety is required in this part of the operation ; for, by proceeding slowly, with due care and caution, every risk may be avoided of injuring the urethra, at the same time that the object in view may be often accomplished with more certainty than if much force was made use of. As soon as we reach the cause of obstruction, if a bougie of the smallest size is employed, instead of pushing it on with force, as to a certain degree may be done with a catheter, it answers the purpose with more certainty to twirl it between the finger and thumb, so as to make it press moderately upon the part that it ought to pass. But, on the other hand, although mischief has often accrued from too much force being used with bougies, and although every practitioner should therefore be warned of the danger that attends it ; yet, when much resistance is met with, they must necessarily be pressed on with firmness. If this, however, is done with caution and in a
proper

proper direction, which experience alone can teach, it may frequently be accomplished. It often happens, indeed, that unless a tolerable degree of force is employed, bougies will not pass, and no benefit will therefore be derived from them; for unless they are made to pass the point of obstruction, they cannot operate with any advantage.

This, I must observe, is a point of much importance, and ought to be kept in view. For although no unnecessary force should be ever employed, yet we commonly meet with too much timidity; for, in ordinary practice, if the bougie meets with unusual resistance, and if it cannot, on the first or second attempt, be introduced, the case is commonly considered as desperate, and no further trials are made. I can from much experience, however, say, that few cases ever occur in which bougies, by a frequent repetition of cautious trials, may not be introduced. Even where I have been convinced that the passage of
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the urethra has at a particular point been entirely obliterated by the sides of it adhering to each other, and where the urine has long been voided by openings in the perinæum, the bougie, with a due degree of force properly applied, has at last proved successful.

In some instances, bougies with small points will enter, when others of a larger size will not penetrate; but, in general, when the obstruction is found to be unusually firm, those of a middling size are preferable to such as have small points: For bougies of this form are apt to bend if they do not pass forward at once; and as soon as the point yields in any degree, the bougie should be withdrawn, as it cannot afterwards be pushed forward; for if more force is employed, instead of being carried farther into the urethra, it becomes twisted, and excites pain in the extraction *.

By

* With a view to give more firmness to bougies, Mr Dease, an ingenious surgeon of Dublin, recommends
their

By different cautious trials, the bougie will at last be made to pass the different points of obstruction ; for in some instances, as I have observed above, strictures are met with in more points than one ; and as bougies have sometimes slipped entirely into the urethra, and even into the bladder itself, this ought to be carefully guarded against, by a piece of cotton-thread connected with the extremity of the bougie, and either tied round the penis behind the glans, or to a circular belt passed round the body.

Certain regulations have been held forth by authors for the time that bougies should be kept in the urethra : But with some patients

their being formed upon catgut.—*Vid.* Observations on the different Methods of treating the Venereal Disease, by William Dease, Dublin.

I may likewise mention, that catgut alone is sometimes used :—When cut into the length of bougies, and on being properly polished by rubbing on a plate of marble, they become sufficiently firm for forcing almost any obstruction ; but, as they swell by the moisture in the urethra, they are very apt to give pain in the extraction.

patients they excite a good deal of pain, while with others they give little or none; and as it is the degree of pain that they induce which ought to regulate the time that they remain in the urethra, nothing decisive, it is evident, can be said with respect to it. When they excite much pain, they should neither be allowed to remain long at once, nor should they be used above once in two or three days: But when they can both be easily introduced and retained in the urethra, they should be often inserted; for as it is by their pressure alone that they prove useful, and as this must be continued for a certain length of time, according to the cause of the obstruction, the more constantly the bougie is used, the more quickly a cure will be accomplished. And with the same view the bougies should be gradually increased, till those of such a thickness can be inserted as the urethra could receive, were we certain that no obstruction had ever taken place.

When bougies excite much uneasiness, they should never be employed but when the patient can confine himself to his apartment; but with many the distress that they induce is so inconsiderable, that they can walk easily with bougies of the largest size inserted along the whole course of the urethra.

Nothing certain can be said with respect to the length of time that bougies should be used, as this must be always regulated by their effects; which, again, will in a great measure depend on the nature of the obstruction. This, however, I can with freedom propose, that they should be continued, not only while any difficulty in passing water remains, but for a considerable time thereafter.

In the use of bougies, care should be taken not to push them into the bladder. For, even when prepared of the best materials, a portion of the composition may crack and fall off; and if this should not pass off with the urine, it may be the

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cause of much distress, by serving as a nucleus for a stone.

Flexible catheters of various kinds have been invented for the purpose of remaining in the urethra, and for answering both the intention of catheters and bougies. Various methods of forming these instruments have been proposed; but the most convenient of any that I have met with, is either a tube of *resina elastica*, or one of flexible silver wire, wrapped spirally round a steel probe of a proper length and thickness; and this being neatly covered with fine linen spread with bougie-plaster, and the probe upon which it was formed being withdrawn, the instrument is thus completed; only it must be afterwards furnished with a silver wire or cleanser, in a similar manner with other catheters.

—These instruments, however, do not prove so useful as was once expected; but when it is ever necessary to allow a catheter to remain long in the urethra, one of this flexible form answers the purpose

exceedingly well. It must, however, be remembered, that as these catheters are covered with plasters, they should not be allowed to remain long in the bladder, for the same reason that bougies ought not to be inserted into it. When it is necessary to leave a flexible catheter in the bladder, those composed of *resina elastica* should be employed, as the adhesive property of this substance prevents it from cracking and falling off, as plasters of every kind are apt to do.

When speaking of the formation of bougies, I have said, that as it is chiefly by mechanical pressure they prove useful; so a proper consistence is the principal circumstance to be kept in view in their composition. This, I must again say, should be our leading object in the employment of bougies: But when there is reason to think that chancres, or venereal ulcerations, exist in any part of the urethra, as nothing would cicatrise the ulcers so quickly as a local application of mercury, a large proportion of quick-silver

ver extinguished in honey may with advantage be added to the composition, as in the formula given above, No. 5. As mercury in this state excites little or no irritation, it may be used with freedom.—Red precipitate in fine powder has also been advised as a proper ingredient in bougies, not only to be applied in this manner to ulcers in the urethra, but with a view to corrode other causes of obstruction: This, however, is a practice that ought to be laid aside, as the precipitate is very apt to stimulate and inflame the membrane of the urethra.

I have thus entered fully into the consideration of the use of bougies. Indeed, too much attention cannot be given to a practice from which such important advantages may be derived: For by a proper application of this remedy, almost every cause of obstruction that I have enumerated, may be either cured, or at least greatly relieved; and was it not for the advantages derived from bougies, almost every case of obstruction would termi-

nate in the most complete degree of misery.

Before concluding the subject, I must not omit to mention the effect of bougies in some cases of troublesome gleets.—Whenever this kind of discharge is kept up by an excoriation or slight ulceration of the urethra, or by any of the common causes of stricture, as is sometimes the case, no remedy proves so effectual as bougies; and even in ordinary cases of gleet proceeding merely from a relaxed state of the excretory ducts opening into the urethra, nothing proves more certainly useful than the compression induced by bougies.—Whether they operate by affording support to the relaxed membrane of the urethra, or by inducing some degree of inflammation upon the parts affected, I know not; but in many instances of obstinate gleet, bougies have been found to prove effectual, when other remedies have failed.

Hitherto I have considered obstructions of the urethra in male subjects only:

ly: But the same disease also occurs in women: Even in females bougies are often used with advantage; but in women tumors of such a size sometimes form in the urethra as cannot possibly be cured by this remedy; and as the urethra in females is not only short, but much wider than in men, these tumors may in them be often removed, either with ligatures or with the scalpel.—Nay, we know from experience, that a tumor adhering even to the bladder itself may, in women, be taken off, not only with ease, but with safety. In such cases, there is a necessity for laying the urethra open; which, at either of the sides, may be done with safety, and without any risk of wounding the vagina: And if an incision is here made with freedom, any tumor situated even near to the neck of the bladder, may be so far pulled down as to admit of the application of a ligature; and whenever this can be done, the attempt may be made without hazard.

A remarkable instance of this is related by Mr Warner, where a tumor of the size of a turkey's egg, produced from the internal membrane of the bladder, was extirpated with a ligature, and with most complete success *. When such tumors are not so large as totally to obstruct the urine, or to be productive of much distress, a prudent practitioner would rather decline to meddle with them. But when the reverse of this is the case, and when the urine is passed with difficulty, necessity points out the propriety of this operation; and it must be comfortable for a patient, in a situation that would otherwise be desperate indeed, to know that a remedy can with safety be employed from which a cure may be expected.

It has been advised even by practitioners of reputation, when obstructions of the urethra proceed from caruncles, or carnosities, as they are termed, to destroy them with lunar caustic; and instruments have been invented for applying the

* *id.* Cases and Remarks in Surgery, by Joseph Warner.

the caustic to the diseased parts, Plate LXXIX. figs. 1. 2. and 3. : But the risk of injuring the contiguous parts, even when the caustic is guarded in the most cautious manner, is evidently so great, as must for ever prevent the practice from getting into general use.

CHAP.

CHAPTER XXXIII.

Of the FISTULA in PERINÆO.

BY the term *Fistula in Perinæo* is meant, a sinuous ulcer of this part, communicating most frequently with the urethra only, but in some instances directly with the body of the bladder. The term, however, is not strictly confined to this acceptation: It is also applied to some ulcers of this part that communicate with the scrotum and penis.

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The word *Fistula* should with propriety be restricted to that variety of sinus in which the edges of the sore have become hard and callous; but custom now applies it indiscriminately to every ulcer that is not superficial, but which lies deep and discharges its contents by one or more narrow openings in the external teguments.

In consequence of the latitude given to the meaning of the term *Fistula*, many appearances are exhibited under this general denomination of *Fistula in Perinæo*. In some a single opening is met with in the teguments of the perinæum or penis discharging matter mixed with urine and this without any hardness or inflammation of the contiguous parts. But in others, instead of this simple form of the disease, along with one or more external openings communicating with the urethra at which all, or at least the greatest part of the urine is passed, the parts contiguous to these openings are much diseased. In some they are found merely hard or callous

lous, without much enlargement ; but in others they are not only hard, but much swelled, inflamed, and painful. In a few, this hardness and enlargement is confined to a small space ; but most frequently, when the disease has been of long continuance, it extends nearly from the anus to the scrotum, reducing the whole perinæum to a state of callosity. In many the malady does not stop here : The scrotum, and even the fore-part of the penis, becomes diseased ; and when the urine at last escapes into the cellular substance of these parts, particularly when it lodges in the scrotum, it never fails to excite a great deal of mischief.

In considering this disease, the causes by which it may be produced, first merit attention. They are in general as follow :

I. Wounds and other injuries of the urethra and bladder, in whatever manner they may be produced.

In the old method of performing lithotomy by the apparatus major, the parts
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were so much bruised and lacerated, that the wound seldom healed kindly, and frequently became fistulous; but when the operation is well performed, according to the present improved method, this seldom happens. From some cause or other, however, it happens in a few instances, that the urine does not flow freely by the penis; and finding a ready passage by the wound, it continues to come off in this manner, till the edges of the fore skin becoming callous, the disease in question is produced. In some, a direct communication is kept up between the neck of the bladder and the fore; but in others, the urine passes first into the urethra, and from thence is discharged into the wound in the perinæum.

Fistulous openings are sometimes the consequence of incisions made into the urethra, for the purpose of extracting stones that lodge in it.

2. Inflammation in any part of the urethra, by whatever cause it may be increased, if it terminates in an abscess, is

ry apt to corrode the membrane of this canal, and to produce a sinuous opening, at which the urine is discharged. This, I may remark, is not an unfrequent consequence of virulent gonorrhœa: For when the inflammation spreads along the perinæum towards the anus, if it be not quickly removed by blood-letting, and such other means as are employed, it is very apt to terminate in suppuration.

Abscesses that form originally in the soft parts about the anus, are also known to give rise to it, by exciting inflammation and stricture, terminating in suppuration, to the cellular substance connected with the urethra.

3. The several causes enumerated in the last Chapter, inducing obstruction of the urēthra, by impeding the free discharge of the urine, frequently give rise to the disease now under consideration: And accordingly we find that fistulous sores in the perinæum are very commonly connected with an obstructed state of the urethra.

As the disease may thus be induced by various causes, it is necessary to have these in view in the course of the cure. In order, however, to render this very perplexing branch of practice as obvious and simple as possible, it is necessary to remark, that the different causes that I have enumerated, tend to the production of the disease by two general effects only:

1. By the formation of a passage directly into the urethra or bladder, either by external violence, or by the destruction of part of the membrane of the urethra, as a consequence of ulcers seated in it, or of matter collected in abscesses tending to abrade its substance; this, we suppose, may occur, independently of any obstruction to the passage of the urine.

2. By the sole influence of obstructions in the urethra: These, by putting a stop to the free evacuation of the urine, at first induce a fulness and tension of the urethra, which, if not quickly removed, very commonly terminates in a complete rupture of this canal.

. In the treatment, therefore, of this disease, we are to be directed by one or other of these general effects; and it is to be remarked, that in no disease is it of more importance to distinguish accurately between the causes by which it is induced. When the opening in the urethra has been produced by previous obstruction, no external application, nor any remedy directed to the system, will have any effect; while a proper and long continued use of bougies, by removing the obstruction, will seldom fail. And, on the other hand, when the disease has not originated from obstruction, but has been induced by a simple opening in the urethra, bougies are not only very unnecessary, but frequently do harm.—This, I must observe, is a distinction not so much attended to in practice as it ought to be. Affections of this kind are commonly treated with bougies only, whatever may have been the cause by which they were induced: But we shall soon make it appear that this must frequently be wrong.

In the cure of fistulous fores of these parts, too, it is a matter of the first importance to distinguish between such as are merely local, and those that are connected with some general disease of the system. For however well our means of cure might be directed to the topical management of the fores, if the patient at the same time laboured under lues venerea, scrophula, or scurvy, no permanent cure could be expected, if the disease of the constitution should not be removed.

Where a fistulous fore is produced by strictures in the urethra, bougies is the only remedy we can trust; and when duly persisted in, and properly applied, they very commonly succeed. They ought to be continued till the strictures are entirely removed, when the urine being freely and easily passed, the fores which the strictures had induced, very commonly heal: When they do not, the cure is for the most part found to be checked, by the edges of the fores having become hard or callous; and till this state of the parts

is removed, no progress towards amendment is to be looked for.

We are therefore to destroy these callous edges of the sore, as soon as it is found that the bougies do not prove effectual; and the method of doing it is this: The patient must be laid upon a table, in nearly the same posture as in the operation of lithotomy; and a staff being introduced into the urethra, and made to pass the opening at which the urine is discharged, it is in this situation to be held firm by an assistant; while the surgeon, introducing a small probe or director at the external opening of the sore, and cutting upon it in the direction of the sinus, is thus to lay it open through its whole length, till it terminates either in the urethra, or, if necessary, in the bladder itself.

When more sinuses than one are discovered, they must all be laid open in the same manner. In some instances, we meet with different sinuses in the cellular membrane, leading from one opening in

the urethra ; while, in others, there are as many openings in the urethra as external fores or sinuses. This, however, is uncommon : But it is not a matter of importance, as the same method of treatment answers equally well in both ; for whether the different sinuses originate from one common opening in the urethra, or not, they ought all to be laid open from one end to the other.

In general, this simple division of the sinuses would prove sufficient ; but when any of the parts through which they run, have become uncommonly hard, a small portion of the diseased parts that lie most contiguous to the fores, should be removed with the scalpel. This, however, is not always necessary, as the inflammation and consequent suppuration, induced by the mere division of the sinus, very commonly removes all slight degrees of callosity ; but when the hardened parts are extensive, and too considerable to be removed in the course of the subsequent suppuration, such a proportion of them should be

cut off with the scalpel, as might not probably be removed in this manner. This, however, is a point on which nothing decisive can be said; for the necessity of removing a portion of these diseased parts, and the quantity to be removed, must, in all such cases, be left to the judgment of the operator.

After all the sinuses have been freely divided, the staff should be withdrawn, and the divided parts gently separated, by the introduction of soft lint spread with any emollient ointment, in order to prevent their immediate reunion. But although some soft easy application should for this purpose be inserted between the lips of the wound, yet this should be done with caution; for stuffing or cramming the fores, as is sometimes done, always does harm, and often renders all the other steps of the operation abortive. The fores are now to be covered with a pledgit of emollient ointment; and proper compresses being applied over it, the T-

bandage should be employed to retain them.

About twenty-four hours after the operation, the outward coverings should be removed, and an emollient poultice applied over the dressings; and as soon as a free suppuration has taken place, the whole should be removed, and light easy dressings continued till the different sores are healed, by a proper adhesion of the parts at the bottom of each.

A very important part of the cure is found to consist in the dressings being duly applied. Indeed, regular dressings are of such importance, that, without this attention, all the previous steps of the operation avail nothing. It is chiefly, indeed, by more attention being given to this in private practice, than can easily be obtained in hospitals, that we prove more successful with private patients in the treatment of sores of this description.

I have not yet mentioned the use of the bougie, nor of the catheter, as a necessary part of the treatment subsequent to
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the operation: And in this I shall possibly appear to be singular; for we are commonly advised to keep a bougie constantly inserted from the time of the operation, excepting at the time of voiding urine, when a catheter is advised to be employed; and in order to avoid the trouble of withdrawing the one, and inserting the other, some practitioners advise a flexible catheter to be kept in the urethra from the first.

The advantages supposed to accrue from the use of bougies here, is the prevention of any undue contraction of the urethra; and by the catheter it is meant to prevent the urine from passing off by the fore during the cure. These motives, for using both the one and the other, are plausible; and they have accordingly been generally adopted. I am free to confess, too, that, following the example of others, I have often employed both the catheter and bougie; but I cannot say that I ever did so with advantage, and I have often seen them do much harm. By distending

the urethra, the fores do not so readily heal; and if the catheter does not pass fully into the bladder, part of the urine, in coming off, almost constantly passes between it and the urethra, so as to get access to the wound, by which it does more harm to the fore than if no catheter had been used: And again, if a catheter is passed entirely into the bladder, and kept long in this situation, it almost constantly does harm, by inducing pain, inflammation, and swelling about the neck of the bladder.

But whoever will go freely into a different practice, and will endeavour to cure this kind of sore without the aid of these instruments, will soon find that they are not necessary; and that the wound in the urethra, from the operation that I have described, is in general more easily cured, without the assistance either of bougies or catheters, than when they are employed; for instead of forwarding the cure of the fores, they uniformly tend to retard it, by frequently tearing open such
adhesions

adhesions as nature, if left to herself, would have made altogether complete.

This, I must again remark, is a point of much importance, and merits all possible attention. The use of the bougie, in all such cases, is at present so universal, that the cure of a fistula in perinæo by an operation, is almost never attempted, but where bougies are at the same time employed; but, from much experience in this branch, I am now convinced that many more would be cured, if the bougie and catheter were both laid aside.

In real obstructions of the urethra, bougies, as I have said, are almost the only remedy to be trusted; but they are of no farther use after these obstructions are destroyed: When, therefore, a fistulous opening remains after the obstructions are removed, the operation I have described ought alone to be depended on; and in this part of the cure bougies ought never to be employed.

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But it is said by those who patronise the use of the bougie and catheter, that if the urine is allowed to pass out by the fore, the cure will be thereby, if not altogether prevented, at least much retarded. To this it may be answered, That after the operation of lithotomy, we do not find the cure retarded, although the urine comes at all times into immediate contact with, and during the first days after the operation passes constantly off by the wound. In what manner this is effected, I shall not at present determine; but that the fact is so, no practitioner will deny: And from all the experience that I have had, openings in any other part of the urethra, require no more assistance from bougies or catheters, than they do in that part of it which is divided in lithotomy; and every lithotomist, I believe, would spurn at the idea of keeping a catheter constantly in the bladder after this operation, in order to prevent the urine from passing off by the wound.

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It happens, indeed, in a few cases of lithotomy, that a contracted state of the urethra is produced by the cicatrix of the fore : In this situation, after the parts are firmly united, bougies prove sometimes useful by removing the stricture ; and in particular instances, where the fore does not heal, by the urine continuing to pass by the wound, in consequence of strictures or adhesions in the urethra, the bougie is employed with advantage even during the progress of the cure. But these are rare occurrences, and no practitioner has ever recourse to bougies, till some degree of obstruction has actually taken place : in the same manner they should never be employed in this operation, till the propriety of using them is pointed out by the formation of some degree of obstruction.

When the parts of which the perinæum is formed have become hard and otherwise diseased, before any operation such as I have described is advised, we are commonly directed to a long continued use of poultices ; mercurial frictions ; and
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the use of resolvent gum plaisters. So far, however, as I have observed, little or no advantage is derived from this ; for any suppuration that it excites, is, in general partial, so that it has little effect in removing the hardness for which it was employed.

And, again, when the hardened parts are extensive, and when no relief is obtained from the discutient remedies that I have mentioned, we are in general advised to cut them entirely away with a scalpel. There is no necessity, however, for this measure ; for although it may be proper to remove the edges of the sores when they have become callous, there is never any good cause for extirpating all the diseased parts : It would frequently be a painful and cruel operation ; and as it could seldom be of any real advantage, it ought rarely, or never to be practised.

When, again, a preternatural opening is formed in the urethra, either by external violence or the abrasion of its substance by abscesses seated in it, a different

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ent course of treatment becomes necessary. When produced by an abscess in the perinæum, or in any part of the urethra, a free discharge should be given to the matter; every part of the cellular substance in which it is found to lodge should be laid open; and warm fomentations and poultices should be applied to such inflammatory tumors as have not suppurated.—In this manner, fores, which if neglected, would prove highly distressful, are often made to heal easily; but when even by these means the fores do not unite, and continue to discharge matter, and especially when their edges becomes hard and callous, the sinuses must be laid open and every other part of the cure conducted in the manner I have already pointed out.

This kind of fore when produced by wounds of the urethra, require a similar method of cure.—By the removal of extraneous matter, and by the use of poultices to abate inflammation, a cure will often be accomplished without any other assistance;

assistance; but, when the state of the fores requires it, they ought to be laid open, and treated in every respect in the manner I have already advised.

The most distressful variety of this kind of sore, is that in which the urine passes off directly from the body of the bladder without communicating with the urethra. This variety of the disease, I may remark, is readily distinguished from the other by the urine drilling off insensibly and at all times; whereas, when the external opening does not communicate directly with the bladder, and when the urine passes first through part of the urethra, the patient has commonly the power of retention in full perfection; by which his situation is much more comfortable than when the urine is constantly passing off.—But although this variety of the disease is easily distinguished from the other, it is not so readily cured; for the sinuses from whence the urine is discharged communicate directly with the bladder; and
nothing

nothing tends to remove them but laying them open to the bottom.*

When, therefore, a patient distressed with this kind of sore, finds his situation to be such as to make the pain and risk of such an operation an eligible alternative, it ought certainly to be advised, as the only means from which any probable chance of relief is to be derived.

As the intention and principle of this operation are the same as of that in which the urethra only is concerned, all that need be said in regard to the mode of performing it is, that a staff should be introduced into the bladder; the different sinuses should be laid freely open to the bottom; their edges, if callous, should be removed to such a depth as can be done with safety, and the wounds thus produced should be lightly dressed, in the manner I have already pointed out.

In this manner, a great proportion of this variety of sore may be cured, provided the means are employed in due time, and duly persisted in: But in long

continued fistulous fores of these parts, where the surrounding cellular membrane has become much hardened, and otherwise diseased; and especially, when the system is tainted with scurvy, scrophula, or lues venerea; it must be acknowledged that no means with which we are acquainted will prove at all times successful.

C H A P-

CHAPTER XXXIV.

Of Hæmorrhoids, or Piles.

THE term Hæmorrhoids or Piles was at one time applied to every evacuation of blood from the veins running upon and in the neighbourhood of the rectum; but a mere distention of these veins, when productive of pain, now receives the same denomination.

As long as the diseased parts of the veins remain distended, and do not discharge any part of their contents, the piles are named *Cæcæ* or *Blind*; but when they burst and discharge blood, they are termed *Apert* or *Open*.

It frequently happens, that a discharge of blood upon going to stool is the first warning or appearance of this disease: For although in some instances it is otherwise, yet when the parts of the veins chiefly affected lie high in the rectum, the pain or uneasiness that they produce is for the most part inconsiderable, owing to the veins in this situation being surrounded with parts which from their softness readily yield to their distention; whereas, when the disease occurs at the end of the gut, as the intestine is here surrounded with a firm muscular covering, the sphincter ani, a good deal of resistance is thereby given to the formation of hæmorrhoidal tumors, and they accordingly in this situation almost always excite a great deal of distress.

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When the piles are so situated as to be within view, if they have begun to discharge blood, one or more small openings are observed, from whence the blood is poured out : When the parts have not been previously much distended, these openings appear to be the mouths or outlets of so many veins : And the openings from whence the blood proceeds, are each of them observed to be seated upon a small protuberance arising from the internal coat of the gut. In general, these tumors, when they discharge freely, are small, being seldom larger than an ordinary pea ; but when any obstruction occurs to the discharge of their contents, they gradually increase, till in some instances they arrive at the size of pigeons or pullets eggs, when by the pain, irritation, and tenesmus, which in such a state they always excite, much distress and misery are produced by them. When at last the tumors burst and discharge their contents, if they have previously become large, they do not disappear entirely :

tirely : On the contrary, they still continue of nearly the same size ; they assume a livid appearance ; and instead of being soft or elastic, they are firm and of a fleshy consistence.

As long, however, as hæmorrhoidal tumors remain shut, they are soft and yielding to the touch, insomuch that by pressure they can commonly be much diminished ; their colour is still more livid than that of the apert kind, and they are commonly more painful : For although they do not usually become large before bursting ; yet when they lie deep, and are thickly covered with firm unyielding parts, the tumors are in some instances of such a size, as almost entirely to obstruct the passage of the fæces ; and as *tenesmus* is a common symptom in this state of piles, the distress produced by the frequent inclination to go to stool, together with the difficulty of the evacuation, never fail to induce a great deal of misery.

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These tumors have commonly been supposed to proceed from a mere dilatation of the hæmorrhoidal veins. In the incipient state of the disease, while they remain small and circumscribed, this may frequently be the case; but whenever the tumors become large, they will almost constantly be found to be connected with an effusion of blood into the contiguous cellular substance.

As long as they remain small, soft, and compressible, we may conclude, that the blood still remains within the cavities of the veins; but whenever they become large, and of a firm fleshy consistence, the blood, as I have just observed, will, in almost every instance, be found effused into the neighbouring parts.

Various opinions have prevailed of the nature of the hæmorrhoidal discharge: But the most prevailing opinion is, that it is commonly of a critical nature; that it is induced by the presence of some peccant or morbid matter in the system;

and that therefore it would, in general, be improper to put a stop to it.

It does not, however require minute investigation to show that this reasoning is ill-founded: For were we even to allow, that the piles commonly appear without the intervention of any evident occasional cause, and that they are in reality connected with some morbidic humour in the blood, in what manner can we suppose this diseased matter to be separated and discharged by the hæmorrhoidal flux? Now that the circulation of the blood is well understood, it will be difficult for the supporters of this opinion to give a satisfactory answer to this question. But independently of this, we know well, that the piles are very commonly induced, perhaps in nineteen cases of twenty, by an obvious cause; and that the removal or prevention of this, when effected in due time, almost constantly prevents or cures the disease. In a great proportion of cases, piles will be found to proceed from compression upon the hæmorrhoidal

hæmorrhoidal veins ; by which the blood contained in them being impeded in its progress to the heart, dilatations of these veins, and subsequent effusions, are consequences that necessarily ensue.

The most frequent causes of this compression are, large collections of hard fæces in the rectum ; the pressure produced upon the neighbouring parts, in pregnancy, by the gravid uterus ; and lastly, tumors, of whatever nature they may be, which, from their situation, press upon the hæmorrhoidal veins.—Thus piles are not an unfrequent effect of schirrous tumors in the rectum, and of similar affections of the prostate gland and bladder, and I have sometimes traced them as the consequence of swellings in the mesenteric glands, which also act by obstructing the reflux vessels in their course from the rectum.

When tumors in the contiguous parts are found to produce the disease, the means of cure must be directed particularly to the removal of these. When

pregnancy is the cause, gentle laxatives, and a frequent recumbent posture will often afford relief; but nothing will remove the disease till delivery takes place. And, again, when piles have been induced by costiveness, a regular use of gentle aperients, such as cream of tartar and oil of castor, will very commonly procure relief. But when the parts inflame and become painful, such remedies must be employed as are known to be most powerful in removing, or even preventing the effects that these symptoms usually induce. If much fever prevails, blood should be discharged in proportion to the strength of the patient; and it proves most effectual when taken by means of leeches applied as near as possible to the seat of the pain: Nay, I often apply them upon one or more of the hæmorrhoidal tumors, and very commonly with much advantage: The pained parts should be frequently bathed with a mild solution of *saccharum saturni*; and the patient should be kept upon a low, cooling regimen.

I here think it proper to mention two remedies that I have often used with much advantage in cases of piles. The one is an ointment composed of equal parts of oak-galls finely powdered, and hogs-lard or butter: This commonly gives more relief in external hæmorrhoidal swellings, than any of the sulphur ointments so frequently employed; and when the seat of the pain is internal, and cannot be reached by an ointment, injections of a strong infusion of galls may be used instead of it. The other is a remedy that I first employed on the suggestion of our late justly celebrated Professor Dr Cullen, balsamum copaibæ. This medicine, given to the extent of fifty, sixty, or eighty drops, morning and evening, not only relieves the pain so frequently produced by piles, but very commonly answers as an easy and certain laxative.

Warm emollient fomentations and poultices sometimes give relief in piles, but as they tend, when long continued,
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to excite too much relaxation in the contiguous parts, by which very large descents of the gut are produced, they should in every instance be soon laid aside.

By the use of one or other of these remedies, all the ordinary symptoms of piles will in general be removed: But there are some states of the disease that can only be relieved by a surgical operation; and these particularly are, frequent returns of profuse evacuations of blood from the hæmorrhoidal vessels, and the piles becoming so large as to induce much pain, irritation, and even obstruction in the under part of the rectum.

When frequent returns of hæmorrhagy have weakened the system too much; and when blood-letting, gentle aperients, and a proper regimen, do not prove effectual, our next resource is to put a stop to the discharge by the direct application of pressure to the mouths of the bleeding vessels. In slight cases of piles, this may be frequently done by a tube of silver,
wrapped

wrapped properly round with soft linen, being passed into the rectum, or a piece of sheep's gut tied at one extremity being pushed into the anus, and a quantity of water or any other fluid being conveyed into the open end of it, and which ought to be of a length to admit of two or three inches hanging out at the rectum, almost any necessary pressure may thus be applied, merely by pushing the water into the upper part of the gut, and securing it there with a ligature *.

In various cases I have proved successful with this remedy, where others have failed, and in some instances I have derived advantage from cold astringent infusions and solutions being thrown into the rectum, such as infusions of red-rose leaves, walnut tree leaves, and oak bark, and solutions of alum, and even saccharum

* Mr Bromfield, when treating of the extraction of the stone in women, advises the urethra to be dilated by means of water contained in the gut of a fowl. In justice to Mr Bromfield, I must observe, that the practice here recommended is taken from this hint.

rum saturni, and white vitriol. When these remedies do not succeed, there is often reason to think, either that the vessels from whence the blood is discharged lie too high in the abdomen to admit of their being acted upon in this manner, or if near the end of the gut, that they are of a considerable size: In the one case, we trust entirely to perseverance in the means that have already been mentioned; particularly to the effect of a low regimen, gentle aperients, and the internal use of alum, kino and other astringents; while, in the other, if the bleeding vessel can possibly be perceived, it ought at once to be secured with a ligature. To those not accustomed to the application of this remedy, it may appear to be of a hazardous nature, but when properly applied, I can, from much experience of the effects of it, venture to say, that it never does harm, while it seldom fails to act with certainty in the cure. The ligatures may be applied here either with the crooked needle or tenaculum;

culum; but the latter should perhaps in every instance be preferred, as with it the ruptured vessels alone can be tied without including any of the contiguous parts, which cannot be done when we employ the crooked needle.

I have already observed, that, in some instances, the tumors produced by piles become very large. As long, however, as they do not become painful, or very inconvenient, they ought not to be touched; but whenever they become so large as to obstruct the passage of the fæces, they ought, if possible, to be removed: When situated near to the verge of the anus, this may commonly be easily done; and even when an inch or more up the rectum, they may frequently be brought completely in view by pressure, similar to what is employed on going to stool.

Various methods have been in use for removing these tumors, namely ligatures, excision, and even the potential and actual cauteries. Neither of the latter, however,

however, should be ever employed; so that the methods by ligature and excision are those we have to consider.

When a hæmorrhoidal tumor is attached by a small root, and when therefore a ligature is easily applied, we are commonly advised to take it off in this manner; and on the contrary, when it adheres to the gut by an extensive surface, we are desired to dissect it off with a scalpel. The very reverse, however, should be adopted, for when the tumors are small, and attached by narrow necks, and when there is therefore no reason to be afraid of any hæmorrhage that may ensue from removing them by excision, as the scalpel may in this case be used with safety, it ought undoubtedly to be preferred, as the easiest and speediest method of finishing the operation; but whenever they are large, and when there is reason therefore to suspect that the arteries that supply them with blood are large, the ligature ought certainly to be

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employed,

employed, as the only safe means of removing them. No good reason has ever been given for confining the use of the ligature to tumors with small necks; for although in these a ligature is more easily applied, yet with due care and attention, even such as have broad extensive attachments may be removed in this manner.

A needle armed with two firm waxed ligatures being introduced through the middle of the tumor at its base, and the ends of one of them being firmly tied round one half of the tumor, whilst the other half of it is secured by the other ligature, the whole may in this manner be removed with as much certainty as when the base is narrow. If the ligatures have been properly applied, the tumor will commonly fall off in the space of three days: In some instances, they drop off in forty-eight hours, or even in less; but in general three days are required. When the scalpel is employed for the removal of these tumors, the parts
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should be afterwards dressed with soft lint, covered with any emollient ointment; but when taken off with ligatures, no dressing is necessary.

C H A P-

CHAPTER XXXV.

Of Condylomatous Excrescences, and similar Affections about the Anus.

THE parts about the anus are liable to excrescences, termed Condylomata, Fici, and Cristæ. The distinctions, however, which these names import are of no moment; for these tumors are all of the same nature, and are cured by the same means.

We sometimes meet with them in the cavity of the gut itself; but most frequently they are confined to the parts exterior to the sphincter. They are of different degrees of hardness, being in some instances not much firmer than the parts with which they are connected; whilst in others they acquire the consist-

ence of the firmeſt ſchirrus. Their colour is alſo very various: In ſome they are of a pale white, and in others of different ſhades of red. In ſome inſtances, a ſingle excreſcence or two is only met with; but in others they cover almoſt the whole parts contiguous to the anus. In ſome they never become larger than ordinary warts; and the diſeaſe, even in its moſt advanced ſtage, is found to conſiſt of a number of theſe, either adhering together, or lying in cloſe contact. But in others the tumors ariſe from the beginning broad and flat, being frequently of the ſhape and magnitude of ſplit garden-beans.

Theſe excreſcences, on their firſt formation, ſeem all to be productions of the cuticle; but when of long-duration theſe commonly adhere to the ſkin itſelf, and in ſome inſtances even proceed to the depth of the contiguous muſcles.

As long as they create no uneaſineſs they ſhould never be touched; and frequently happens that they never be

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come so large as to require much attention; while in some they excite so much distress that we are obliged to remove them immediately.

In the softer varieties of these excrescences, rubbing them from time to time with crude sal ammoniac, or washing them with a strong solution of that salt, or with spirit of hartshorn, will frequently remove them. The pulvis sabinæ too, in fine powder, often answers the purpose, as well as red precipitate of mercury, particularly when mixed with equal parts or thereby of calcined alum; but all of these remedies are slow in their operation; and when the tumors are hard and warty, they have little or no effect in removing them. When they do not therefore succeed, we employ either the scalpel or lunar caustic: But when the patient will submit to the scalpel, it ought always to be preferred; for no danger can arise from it, as the parts to be removed are not supplied with large blood vessels. All the diseased parts should be completely removed; and dry

lint being applied to the fores, they fall afterwards to be dressed like wounds produced in any other way.

When the fears of a patient, however, prevent him from submitting to this operation, caustic must necessarily be employed: But in the use of this remedy, much attention is necessary, to prevent it from spreading to the gut; for mischief might ensue were it to be directly applied to it.

CHAPTER XXXVI.

Of a Prolapsus Ani.

A PROTRUSION of any part of the rectum beyond its usual limits, is termed a Prolapsus Ani. In some instances the displaced portion of gut is inconsiderable, but in others it falls down to a great length.

The sphincter ani and neighbouring parts, whilst in full strength, serve as a base or support to the superior part of the gut: Whatever, therefore tends to induce

any morbid debility of these, will necessarily have some influence in the formation of a prolapsus ani.

The most common cause, however, of this protrusion of the gut is, frequent and violent exertions excited in the rectum itself by some irritating cause about its extremity. Thus producing what we commonly term tenesmus: A frequent use of aloetics is said to be very apt to excite irritation in the rectum, although from much observation, I am now inclined to doubt the truth of it; but I have much reason to think, that the small worms termed *Ascarides*, by lodging chiefly in the under part of the rectum, and by thus producing irritation, have in different instances induced descents of the gut. Habitual costiveness, hæmorrhoidal swellings, and in short every cause that stimulates the rectum to over-exertion, will also be apt to produce it.

The rectum often remains unreduced for a great length of time, and no bad

consequences ensue: Hence it is evident, that this portion of gut will bear more exposure to the air than the other parts of the intestines; but we ought not from this to be ever induced to allow any part of the gut to remain long down without making some attempt to reduce it. By many, we are desired, before reducing the gut, to foment it well with emollient and antiseptic decoctions; and the operator is directed to cover his fingers with oiled or waxed linen before any pressure is made upon the gut. These previous steps, however, are not necessary. We should instantly indeed endeavour to return the prolapsed parts, without allowing them to be exposed to such injuries as might ensue from the delay in fomenting them; and as we can handle the parts with more exactness when the fingers are bare, than when covered with oiled or waxed gloves, these ought never to be employed; but when any covering is judged to be necessary, a piece of soft

oiled cotton cloth answers the purpose better than any other.

The patient being put into bed, and laid upon one side, or upon his face, which answers better, with his buttocks elevated above the rest of his body, the surgeon should now press firmly, though equally, with the palm of his hand upon the under part of the protruded gut. By a continuance of this kind of pressure, the gut is in general easily reduced; but when this does not succeed, we seldom fail by pushing up the superior part of the gut with the fingers, while the palm of the other is made to support the inferior part of it. When, indeed, the prolapsed portion of gut has previously become much inflamed and swelled, no means of reduction will succeed till these are removed. In this situation, therefore, before pressure is employed, it may be proper to discharge a quantity of blood in proportion to the strength of the patient; the gut should be fomented with a weak solution of saccharum saturni,

turni, moderately warm; and when, by these means, the swelling is nearly, or perhaps entirely removed, the prolapsed parts will be easily reduced in the manner I have already advised.

We seldom indeed find it difficult to reduce protrusions of the rectum; but it is often no easy matter to retain them after they are replaced: For the sphincter ani, by repeated descents of the gut, often becomes so relaxed that it does not retain it; so that a protrusion takes place, not only on going to stool, but often on every attempt to walk, or to sit in an erect posture.

When the gut thus falls readily down, much advantage may be derived from a proper bandage. After the protruded portion of gut is replaced, if a thick compress of linen is applied directly upon the anus, a proper application of the T-bandage over the whole proves often useful. But in Plate LXXVIII. fig. 3. I have delineated a truss originally invented for
this

this purpose by the late Mr Gooch *, by which the parts may be more completely retained than with any other bandage, while at the same time the patient may be allowed more freedom than he could otherwise possibly venture on.

The parts that protrude upon going to stool being immediately replaced, an operation that the patient himself can often accomplish, this truss should be directly applied; and with a view to strengthen the sphincter ani and neighbouring parts, the debility of which is often to be considered as the sole cause of the descent, the patient should be advised to the use of steel, bark, cold bathing, and dashing cold water upon the buttocks and under part of the back: Considerable advantage has also been experienced, from a frequent use of astringent injections, particularly infusions of galls and oak-bark; and when a small proportion of opium is added to the liquor, the irritability

* Vid. Cases and Practical Remarks in Surgery, &c. vol. II. by Benjamin Gooch.

bility in the rectum, which is often to be considered as the original cause of the disease, is thereby more effectually removed than in any other way. I have sometimes ventured to add a small quantity of alum, and saccharum saturni, to these injections; but in general, any addition of a saline nature is here inadmissible, from the irritation that such remedies commonly give to the gut.

By one or other of these means, the disease may either be entirely cured, or at least so far palliated as to obviate every inconvenience from its continuance.

CHAPTER XXXVII.

Of an Imperforated Anus.

AN imperforated anus is not an uncommon occurrence, so that every midwife should examine with attention the state of this and other natural passages immediately after birth.

In some, the end of the rectum is somewhat prominent where the anus ought to be, and only covered with skin and a small quantity of cellular membrane: But in others, no vestige of the rectum is perceived;

ceived; and the skin retains its natural appearance, without being any where elevated between the scrotum and point of the coccyx.

In some, the rectum terminates within an inch of the ordinary seat of the anus; in others, it has reached no farther than the top of the sacrum. In some it has been known to terminate in the bladder; and in others, in the vagina.

When the assistance of a surgeon is required, as death must ensue if a proper vent be not obtained for the fæces, no time should be lost in deliberation. If the end of the gut is found to be covered with skin only, and if a protuberance is formed by the fæces pushing it forward, all that a surgeon can do, is with a scalpel or lancet to make an opening of a sufficient size; but when this kind of direction is not met with, more difficulty and danger is to be dreaded.

When the gut is deep, an incision of an inch in length should be made directly on the spot where the anus ought to be;

and

and this should be continued with gradual and repeated strokes of the scalpel, in the direction that the rectum ought to take; not in a direct course through the axis of the pelvis; for in that direction the vagina or bladder, or perhaps both, might be injured; but backwards along the coccyx, where the risk of wounding any part of importance is less. The best director is the finger of the operator. The fore-finger of one hand being inserted into the wound, and passed towards the coccyx, the surgeon, with the scalpel in the other, should dissect gradually in this direction, either till he meets with fæces, or till the scalpel has reached at least the full length of his finger; and if, after all, the fæces are not reached, as death must ensue if more be not attempted, I would advise a long trocar to be pushed forward upon the finger, in such a direction as the operator thinks will most probably meet with the gut.

In this manner many lives have been saved which would otherwise have been lost.

lost. I myself have had two such cases; in both of which the gut lay deep, and in both I was fortunate enough to form an anus, which for many years has continued to answer the purpose sufficiently. But in each of these it was exceedingly difficult to preserve the passage sufficiently wide: For as soon as the dossils of lint and other tents employed for preserving the passage were withdrawn, a very strong contraction took place, by which the opening was occasionally nearly obliterated. Sponge tent, gentian root, and other substances that swell by moisture, were at different times employed; but these uniformly gave so much pain and irritation that they could not be continued. They are commonly, indeed, recommended in such cases; but all who have ever employed them in parts so exquisitely sensible as the rectum, will readily admit the impropriety of the advice.

Dossils of soft lint moistened in oil, and rolls of bougie plaster of a proper size, were

were found to irritate less, and to answer better than any other application; and for the purpose of dilating the passage, when, at different times during the cure, it was found to have become too strait, the method I have already advised, of compressing blood-vessels in the rectum by introducing a sheep's gut, shut at one end, into it, and forcing water up by the other, was employed with advantage. But upon the whole, although this part of the cure may appear to those who have not met with such cases, to be simple and easy, it is found to be much otherwise in practice. Indeed, no case in which I was ever concerned gave so much perplexity and trouble either to the patient or myself, as each of those I have mentioned; for although in both, the openings were at first made sufficiently large, yet nothing but continued attention for the space of eight or ten months prevented the necessity of a frequent repetition of the operation. When the skin alone is to be cut, it is a simple

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matter indeed; for in this case nothing is in general necessary but the introduction of a doffel of soft lint for a few days into the opening. But when the rectum lies deep, I am inclined to think, from the event of those cases, that although ultimately, a complete cure may commonly be obtained after a free discharge of fæces is procured, that much care and attention on the part of the operator will always be required for a considerable time after the operation; and in general we may suppose, that the difficulty will be in proportion to the depth of the cut.

Even where the gut terminates in the bladder or vagina, the operation should be advised: For, as in the one case, all the fæces must be emptied into the bladder, there would be much risk of such accumulations being formed in it as would soon put a total stop to the discharge by the urethra; and in the latter, where the rectum terminates in the vagina, much distress would ensue from it, which a successful

cessful issue of this operation alone could prevent.

When it unfortunately happens that no passage is obtained for the fæces by any of the means that I have mentioned, might not we attempt an opening above the pubes, or perhaps on the right side, so as to reach the caput coli, with a view of making an artificial anus? It is true, that the chance of success from such a measure would not be great; and, even admitting that the attempt should succeed in the most complete manner, the discharge of fæces from the opening would always prove troublesome and very uncomfortable; but the melancholy idea of leaving a child in such a state, to die in much pain, must prove so highly distressful, both to the parents and operator, as would incline me rather to advise even the doubtful and desperate remedy I have mentioned.

CHAPTER XXXVIII.

Of the Fistula in Ano.

EVERY sinuous ulcer in the neighbourhood of the rectum is termed a *Fistula in Ano*. This is the most accurate and most simple idea that can be given of the disease: For although, in different instances it assumes a variety of appearances, and although the descriptions given of these have tended to render this part of chirurgical pathology extremely perplexed, yet whoever will attentively

consider all the circumstances that relate to it, will find, that the fistula in ano is of a nature as determined and fixed as any disease that falls within the province of Surgery.

Several varieties of this ulcer are described by authors: An external opening contiguous to the anus, communicating with an internal ulcer, but without any connection with the rectum, is termed an *Incomplete Fistula*: When the ulcer has two outlets, one external, and the other opening into the gut, the fistula is said to be complete; and again when it communicates with the gut only, without any external opening, it is termed an *Internal or Occult Fistula*.

This disease has been likewise distinguished into Simple and Compound. When the parts through which the sinus runs are hard and tumefied, or when a communication is discovered between the ulcer and the bladder, vagina, os sacrum, and other contiguous parts, the fistula is said to be of a complicated or compound nature;

nature; and it is termed a Simple Fistula, when all the neighbouring parts are found.

In the commencement of the disease, the contiguous parts are very commonly found; but whenever the ulcer has been of long duration, not only the parts about the anus, but even the perinæum and buttocks, frequently become diseased. This may depend on different causes, but it appears most frequently to proceed from the matter of the abscess or sinus not finding a proper vent, and from its being allowed therefore to spread along the contiguous cellular substance.

Thus, we sometimes find, that the perinæum and part of the buttocks have become hard, with various sinuses running in different parts of them; and when the matter is sharp and acrid, instances occur of the os sacrum becoming carious, and of the bladder and vagina being corroded so as to have the contents of the rectum emptied into them. This last stage of the disease is not, however, of-

ten met with; and it would probably never occur, if the disease were properly managed from the beginning, by a free discharge being given to the matter.

In enumerating the causes of the disease, it may be remarked, that whatever tends to the formation of matter about the anus, may produce it. Thus the piles, condylomatous tumors in the neighbourhood of the rectum, hardened fæces collected in the extremity of the gut, and in short, whatever can excite irritation and inflammation of these parts, will occasionally terminate in suppuration; and, if the matter thus produced be not absorbed, or if the fore formed by the bursting of the abscess, does not soon heal, a sinuous ulcer will very readily form. I may also remark, that abscesses in these parts frequently succeed to fevers and other diseases of the constitution.

The circulation being more languid here than in other parts, every inflammatory tumor that forms in it is not only more

apt to suppurate, but the sores that ensue heal with difficulty. They always excite much distress, and require much caution and attention in the treatment. We have it much in our power, however, with proper management from the first appearance of inflammation about the anus, to prevent much of that pain and misery, that these tumors when neglected, are ultimately sure to induce.

As soon as this kind of tumor has advanced so far as to make it probable that suppuration will ensue, every means that can accelerate the formation of matter should be advised: And as nothing answers this purpose with such certainty as a continued application of heat, warm emollient poultices, fomentations, and the steams of warm water, are chiefly to be trusted. By a due application of these remedies, the tumor may in general be made to suppurate quickly; and as soon as matter is formed, it ought to be discharged by a free incision in the most depending part of the abscess.

In this stage of the disease, much more depends upon the abscess being freely and timeously laid open than is commonly imagined; for if this is long delayed, or if the opening is not made of a size sufficient for discharging all the matter, it is thus allowed to pass into the contiguous cellular substance, so as to separate not only the skin, but all the under part of the rectum, from the muscles and other parts with which they naturally lie in contact: And in this manner, instead of a simple forè, which, when the abscess is rightly treated, is all that we ought to meet with, the whole underpart of the gut is in some instances entirely separated from the surrounding parts, and a variety of sinuses form in different directions, either along the perinæum, or by the side of the gut, and in some instances among the muscles of the hips.

With a view, therefore, to prevent these distressful consequences, as soon as an abscess in this situation is found to contain

contain matter, it ought, as I have observed already, to be opened by a free incision; by which means, and with due attention to the subsequent treatment of the sore, if the constitution is otherwise found, a speedy cure may in general be expected.

The matter being discharged, dossils of lint are commonly crammed into the sore, with a view to prevent, as it is said, the parts newly divided from adhering too soon. This, however, is a very erroneous practice: For extraneous substances of every kind, by the irritation that they give to the rectum, almost always do mischief; and, if the opening is of a sufficient size, there is no necessity for this precaution, as the constant discharge of matter from the sore, proves in general sufficient for preserving it of a size adequate to the quantity produced, and this I may remark is the principal object we have in view from the operation.

Instead of irritating the parts, therefore, by the introduction of dossils, as soon

soon as the matter of the abscess has been freely discharged, the fore should be merely covered with soft lint spread with any mild ointment, and an emollient poultice applied over the whole.

Any hardness that did not disappear during the suppuration, will thus be soon removed, and a cure will in general be quickly obtained.

It most frequently, however, happens, that the aid of surgery is not desired in this first and very simple state of the disease; nor till the abscess has burst of itself, and perhaps at an improper part; and till of course much mischief is produced, by the matter having insinuated into the surrounding cellular substance: In this situation, one or more sinuses are commonly met with, forming, according to their duration, different degrees or stages of the real fistula in ano.

When, in this state of the disease, the advice of a practitioner is desired, the first object he should have in view, is to discover with accuracy the course of the sinuses;

sinuses; for nothing can with propriety be done till this is accomplished. When the sinuses discharge their contents by external openings, the direction in which they run is for the most part easily discovered: If they run along the perinæum, or spread among the muscles of the hips, a probe, introduced in the usual manner, will readily pass along the whole of them: But when any of the sinuses follow the direction of the gut, the fore-finger of one hand, after being well oiled, should be introduced into the rectum at the same time that the probe is entered at the wound with the other: By this means we not only prevent the gut from being much injured by the probe, but if any communication has taken place between the gut and the sinus, it is in this manner easily discovered by the point of the probe passing from the sinus, and being found in the gut with the finger. In a few cases, however, even when we know that the sinus communicates with the gut, the probe does not pass easily from one to the

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the other ; but with due perseverance we always succeed ; and if the probe is rightly managed, it may always be done without risk of injury to the gut.

As our knowing with certainty, whether the sinus communicates with the gut or not, is of much importance in the cure, nothing should be overlooked that may enable us to determine the point with precision. When air or fæces are discharged by the sinus, or when water or any other fluid injected into it, is returned by the anus, the existence of such a communication cannot be questioned.

The absence, however, of these tests, does not imply that no communication takes place between the gut and the sinus : For we know that the passage of fæces from the rectum into fores of this description, does not always happen ; and we may easily suppose it possible for an opening between the sinus and the gut, to be so formed as to prevent the passage of liquids from one to the other.

When,

When, by a repetition of cautious trials with the probe, or with injections of warm water into the fores, the course of the different sinuses is discovered, the method of cure is next to be determined. In a preceding part of this work, the method of curing sinuses has been pointed out *: But from the nature and situation of the parts in which this variety of the disease is seated, some peculiarities occur in regard to the cure.

Astringent injections, pastes and ointments of the same nature, have at different times been recommended for putting a stop to the discharge of these sinuses. But the caustic property of these remedies is by no means suited to the irritability of the parts in which this disease is seated; nor have they by experience been found to answer the intention for which they were proposed: They have now therefore very universally fallen into discredit.

I

* Vide Chapter V. Section V.

I have elsewhere shown, that the leading object to be kept in view in the treatment of sinuses, is the destruction or annihilation of the cavities from whence the matter is discharged. With a view to this, different means have been advised. Where pressure can be employed, the sides of sinuses are, in some instances, made to adhere by means of it. But in the fistula in ano, this method of cure is inadmissible, as in this situation no regular or equal pressure can be applied.

This being the case, and knowing that adhesion readily takes place between contiguous parts in a state of inflammation, we endeavour to excite inflammation upon the parts that we wish to adhere to each other. It is perhaps indeed a doubtful point, whether animal substances can be made to adhere permanently by any other means than through the intervention of inflammation.

For the purpose of exciting this inflammatory or adhesive state of a sinus, so necessary for the reunion of its sides, disse-

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rent means may be employed. It may be accomplished either by the introduction of a cord of cotton or silk along the course of the fore, or by laying the sinus open through its whole length, so as to convert it as nearly as possible into the state of a recent wound.

In other parts of the body I have advised the use of a cord, or seton as it is termed, in preference to every other method of cure; as by means of it, we have it in our power to excite almost any degree of inflammation, without any of the disadvantages that sometimes ensue from the extensive cicatrix of a large wound. In the fistula in ano, however, the seton cannot be employed; for the irritation that it would excite, would prove too severe a stimulus for the rectum, with which it would at all times be in immediate contact.

As in this situation, therefore, astringent and escharotic injections and pastes cannot be employed with safety, as pressure is inadmissible, and as cords of even

the softest materials would excite a very insupportable degree of irritation; we are under the necessity of employing the only other remedy by which a due degree of inflammation can be induced, namely, a free and extensive incision along the whole course of the sinus, commencing at one end of it, and terminating at the other.

Having thus endeavoured to ascertain the proper method of cure, we shall now proceed to describe the easiest and most effectual manner of putting it in practice.

The course of the different sinuses having been discovered by a previous search in the manner I have advised, as it is of importance to have the alimentary canal, and particularly the rectum, emptied, a purge should be given on the preceding day, and a glyster an hour or two before the operation.

The operation is often done while the patient stands with his back to a clear light; but it answers better to place him upon a table, in the same manner as is done for

the operation of lithotomy, with his legs bent and kept asunder by an assistant on each side.

The patient being firmly secured in this situation, the surgeon, after dipping the fore-finger of his left hand in oil, should pass it as far as it will reach into the rectum: With his right hand, he must now enter the point of the probe-pointed bistoury, at the external opening of the fore; and having passed it along the whole length of the sinus, till he feels the point of it through the opening in the gut, upon his finger in the anus; for I am here supposing that a communication takes place between the sinus and the rectum; he is now to push the point of it in upon his finger; by means of which, he not only protects the opposite side of the gut, but, by thus directing the point of the instrument, he cuts steadily, and the sinus is in this manner laid open with much ease from one end to the other. This being done, if any other external openings are perceived, the finger should be again

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passed

passed into the rectum, and every sore that is met with should be laid open in the same manner. The bistoury to which I allude is delineated in Plate LXIV. fig. 2. and 3.

By many it is supposed that every external opening that we meet with, communicates with a separate and distinct sinus; and some have gone so far as to say, that these again are commonly found to communicate by separate openings with the gut. This, however, is seldom, if ever the case; for I have very universally found, that all the external sinuses communicate with one common sore or abscess, and that this, in a great proportion of cases, perhaps in ninety-nine of every hundred, communicates with the rectum by one aperture only: and at any rate the means to be employed, are in both cases the same. Whether the external or internal openings communicate with one or with more abscesses, they should be laid freely open from one end to the other.

In almost every instance, however, we find, that when the principal sinus is laid open through its whole course, from the entrance of the knife to the aperture in the rectum, the others are found to run no farther than into some part of the fore, without communicating directly with the gut; so that their entire division is easily and quickly accomplished.

I have desired, in searching for the different sinuses, that this part of the operation may be accurately done; so that it may be known with certainty, whether the fores communicate with the gut or not: If a communication is discovered, the knife should enter by this opening from the sinus into the gut; for the opening is commonly at the most superior point of the sinus, and it is likewise proper that the knife should be made to pass in such a direction that the aperture into the gut may form a part of the incision: For, if this should not be done, little or no advantage might be derived from the operation; the parts would not readily adhere

at this point; and the fæces getting access to the cellular substance behind the gut would be apt to give rise to a new collection of matter.

It frequently happens, however, that no direct communication can be discovered between the sinus and rectum; in which case the fistula, as I have already remarked, is said to be incomplete: But, in the method of cure, the treatment is nearly the same as when such a communication takes place; only with this difference, that in the latter, the point of the bistoury passes into the gut at the aperture found in it; whereas in the other, an opening must be made in it at the superior part of the sinus, by pushing the point of the bistoury against the finger in the rectum; and this being done, the operation is to be finished in the manner I have mentioned, by drawing the point of the instrument out at the anus, so as to divide the sinus through its whole length.

In the course of this operation the sphincter ani is always divided if the
fistula

fistula penetrates to any considerable height in the rectum: But this is not of such importance as at first sight might be imagined; for although some degree of inability to retain the fæces frequently ensues for a short while after the operation, yet experience shows that the parts in general recover their tone very completely, insomuch that want of retention is scarcely ever mentioned by the patient as any of the inconveniencies that ensue from it.

Various instruments have been proposed for effecting this operation; but none of them answer the purpose with so much ease and safety as the probe-pointed bistoury. A razor, with a probe-point, Plate LXII. fig. 1. may be used in nearly the same manner: But the bistoury is possessed of all the advantages attending the razor, and as it can be directed with more steadiness, it ought to be preferred.

Some have objected to this mode of operating, that in the case of an incomplete fistula, the point of the bistoury, on being pushed through the gut, will be apt

to hurt the finger in the rectum ; and likewise, that it can never be applicable where the sinus runs farther up the rectum than the finger can reach : And with a view to obviate these inconveniencies, different instruments have been proposed, particularly a director and scalpel.

The director, which ought to be large, being passed into the rectum, the sinus or fistula is advised to be laid open through its whole length, by a scalpel being made to run along the whole course of it from the external opening of the sinus. This, I must observe, however, is a practice not to be imitated : The hazard attending it is evidently indeed so great, that it has seldom been attempted, nor will it probably be ever recommended but by such writers as copy from one another. The parts chiefly affected by the operation, lie so contiguous to organs that ought not to be injured, particularly to the bladder, that we should never on any account attempt to lay sinuses in this situation, open, unless the finger is previously

ously introduced to serve as a guide for the bistoury ; and for the same reason the instrument should never be carried farther than the length of the finger. Fistulous sores do not commonly penetrate deeper here than the length of the forefinger : In some cases, however, they go to a greater depth : They have even been found to pass to the very superior part of the os sacrum, and across the pelvis in a direction between the rectum and bladder. In every such instance, however, all that an operator should attempt, is to lay the under part of the sore completely open, so as to procure as free and easy a discharge to the matter as possible ; for any advantage to be derived from the incision being carried to a greater depth than the finger can reach, would seldom if ever compensate the hazard of the attempt : And whenever the sinuses are confined to the under part of the gut, no other director than the finger is required ; for whoever has done the operation in the manner I have advised, will find that the
rectum,

rectum is easily pierced with the probe-pointed bistoury, and that it may be done without hurting the finger previously passed into the gut.

It is alleged by some, that danger may occur from sinuses in this situation being cut freely open: Troublesome hæmorrhagies, they think, may happen, from the hæmorrhoidal arteries and veins being cut; so that it has been proposed to open the sinuses with ligatures: By inserting one end of a piece of pliable silver or lead along the course of a sinus, pushing it into the rectum, drawing it out at the anus, and twisting the ends of it together, the contained parts are thus directed to be gradually compressed and divided. But this being not only more painful, but also more tedious, than the method of dividing these parts with a bistoury, and as we have few instances of the hæmorrhagy that ensues from this operation being severe, the latter is very universally preferred: The late Mr Desfault of Paris, a surgeon of much eminence and respectability,

bility, conceived, indeed, a partiality for the method of curing this disease with a ligature formed of lead or silver wire, and he contrived a very ingenious apparatus for passing the lead; but for the reasons that I have given, there is no reason to suppose that it will ever be much employed by others.

The different sinuses being all laid open with the bistoury, much care is required in the application of the dressings, for on this the success of the operation in a great measure depends. Some, however, are so inattentive to this, as to suppose that every thing necessary is done, when the division of the parts is completed; but this is so far from being the case, that I may freely assert, that a cure will seldom be obtained, if much attention be not given to the subsequent treatment of the fores.

The parts, however, ought not to be much crammed with dressings; nor should any thing be employed that is not perfectly mild, and incapable of exciting much irritation.

irritation. Dry lint is almost the only application that practitioners use, but it is ill suited for the purpose. One of the most distressful symptoms that ensues to this operation, is diarrhœa, attended with tenesmus, or a frequent desire to go to stool. In some, the division of the sinuses alone appear to excite this; but it very commonly may be traced as a consequence of the after management of the sores: For every application that is not perfectly mild, and especially if forcibly pushed to the bottom of the wound, is sure to induce a very distressful degree of irritation in the end of the gut; and as this almost always excites a frequent discharge of fæces, that not only tends to reduce the strength of the patient, but to interrupt the cure of the sores, it becomes highly necessary to avoid it.

With this view, instead of dry lint, I have long been in the practice of using fine thin old linen dipped in oil or spread with any simple mild ointment; by which we with certainty avoid that distressful irritation which

which dry applications to such sores never fail to induce. After the wounds, therefore, have been cleared, a very small pledgit of this kind of linen, thinly covered with simple liniment of wax and oil, should with the end of a probe be gently inserted between their edges; but not to such a depth, or with such force, as to give any kind of uneasiness. This being done, and a cushion of fine tow, covered with a compress of soft linen, being applied over the parts, and secured with a T-bandage, the patient should be carried to bed; and the dressings being renewed, either after every stool, or, when these are not frequent, once in the twenty-four hours, the sore will in general fill up from the bottom; and will at last cicatrise in the same manner as wounds in any other part. This kind of sore should indeed be managed in every respect like similar sores in other parts of the body: For although something mysterious or peculiar has commonly been supposed to exist in sores about the anus; yet this is by no means the case;

case: They are of a nature exactly similar to fores in other parts, and are to be cured at all times by the same means. They should be lightly and easily dressed, in the manner I have advised. No injections should be used, as is often done with a view to cleanse the parts. They are not more necessary here than in any other fore, and I have constantly seen that they do harm. They not only irritate and inflame the parts to which they are applied, but if used with much force, the liquor is apt to find its way into the contiguous cellular substance, and in this manner may form new sinuses. They should in no instance therefore be employed.

I have already observed, that, by perseverance in this mild course of treatment, a cure will, in general, be obtained. But in some instances it is otherwise; and instead of a good discharge, and red fresh granulations, with which the wound in a healing state ought to be covered, the parts become soft, flabby, and unhealthy, and the matter is thin, fetid, and perhaps
mixed

mixed with blood. If, on a minute inspection of the fore, any part of a sinus is found to have escaped notice, and if matter is found to lodge in it, a certain and almost immediate advantage will be derived from laying it open to the bottom. The most frequent cause of failure indeed in this operation is want of attention to this very necessary point; in the first place, by due pains not being taken to discover the sinuses in the time of the operation, and an inclination afterwards to perform the cure by any other means, rather than put the patient to the pain of another operation, or candidly avow our own error, which in every instance should freely be done. I readily own, that when I first settled in business, I fell into this error in different instances: By not searching with sufficient pains after the first incision was made, sinuses escaped notice that might have been discovered; but having long been convinced, that a patient had better be kept much longer on the table, so as to have all the parts examined
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in the most accurate manner, than to incur the risk of a second operation, I now spend so much time upon this, that in the course of these twelve or fourteen years, scarcely an instance has occurred with me, out of some hundred cases, of the operation being from this cause to be repeated: I own, however, that more time is for this purpose spent on the operation than is commonly done.

It sometimes, again, happens, that the cure of the sore is retarded, not by any fault in the operation, but by real disease of the system: In this case, if the patient is found to labour under lues venerea, scrophula, or scurvy, the remedies appropriated to the existing disease should be prescribed; or if the constitution is merely relaxed or weakened, whether by fever or any other cause, the natural tone of the system should be restored, by a nourishing diet, a proper allowance of wine, and residence in good air.

When treating of Ulcers in Chapter V. I have endeavoured to inculcate the utility

ty of issues in every variety of fore; but in no variety of the disease does this remedy act with more advantage than in the fistula in ano, especially when the discharge has been of long duration. Different instances, indeed, have occurred to me in which, where issues were not inserted, the patient was obviously injured by curing the disease: Other diseases of a more alarming nature were induced by it; while in some I have not been able to obtain a permanent cure of the sinus till an issue was inserted: I am now therefore so much convinced of the utility of issues, that whenever the disease has been of long duration, and the discharge copious, I never advise the operation till an issue is inserted.

Hitherto, I have been supposing, that the disease has not advanced farther than to produce sinuses along the course of the rectum, and parts immediately contiguous. We shall now proceed to consider it in its more advanced stages.

The first of these, that I shall notice, is that in which the parts lying contiguous to the fores have been separated, or detached from each other, by a mere effusion of matter into the surrounding cellular substance. This, to a certain degree, is the case in every sinus; but when sinuses about the anus have been of long duration, the matter that they produce, if it does not find a free outlet, spreads in some instances so extensively among the contiguous parts as to separate, not only all the skin and other teguments from the muscles underneath, but to detach all the under part of the rectum from the cellular substance with which in a state of health it is firmly connected. Of this I have now met with various instances.

In this state of the disease, two modes of operating have been advised; either to take away a considerable portion of the teguments, so as to give free vent to the matter; or, if this does not prove successful.

cessful, to extirpate all the inferior part of the rectum that is found to be separated from the contiguous parts.

These operations, however, not only give severe temporary pain, but much subsequent distress; and as all the advantages that arise from them may be attained in a more easy manner, they ought undoubtedly to be laid aside.—To take away any large portion of the teguments about the anus, must of itself be extremely painful; and to extirpate the extremity of the rectum, would in a great proportion of cases be productive of more misery than could ever be induced by a continuance of the disease; for, besides the difficulty and pain that in this situation would arise from the passage of hard fæces, it would be impossible for the patient to retain liquid stools.

This distressful operation, however, need never be put in practice; for I know from various trials, that a simple division of the gut will with more certainty accomplish a cure: All that ought to be done therefore is, to lay

the detached portion of gut open from one end to the other in the manner I have already pointed out in cases of simple sinus : And if this does not allow the gut to apply equally to the contiguous parts, another incision should be made on the opposite side of it ; by which means all such parts of it as were separated or detached from the surrounding muscles will now be equally applied to them ; no part of it will be puckered or unequal ; and if the neighbouring bones and other parts are sound, and the constitution not diseased, a cure will soon be obtained by adhesion again taking place between the gut and parts that lie behind it.

Upon the same principles that in this situation we advise a division of the rectum, when the matter has passed between the skin and muscles of the perinæum, or of the hips, the bag in which it is contained should be freely laid open from one end to the other ; and if one incision is not sufficient, another should be made without delay : The same dressings should be

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be applied here that I have already advised where the sinus runs behind the rectum.

Hitherto I have supposed that the fistula or sinus discharges its contents by one or more external openings in the neighbourhood of the anus: This, however, does not always happen; and the matter, instead of being discharged by an external opening, is in some instances, first emptied into the gut, and afterwards discharged either by itself, or mixed with fæces on the patient going to stool. This, as I have already observed, forms what has been termed an Occult Fistula, or, according to French authors, *une Fistule Borgne*.

As the usual and most certain characteristic of fistula, namely an external opening discharging matter, is here wanting, some attention is required to ascertain its existence, as well as to prevent other diseases from being confounded with it.—Thus, matter discharged from abscesses in the upper part of the alimentary canal, has, in some instances,

been supposed to proceed from an occult fistula in the neighbourhood of the anus; and vice versa, pus collected in and discharged from an impostume near to the anus, has merely from want of attention, been supposed to originate from disease in the upper part of the gut; and upon this supposition, remedies have been prescribed without effect, when a complete cure might have been obtained by very simple means.

The distinction, however, between these diseases is, in general, sufficiently evident. When matter collected in the superior part of the gut, is at last discharged by stool, it is commonly thoroughly mixed with, and seems to constitute a part of, the fæces, and no pain takes place near to the anus. But in the case of an occult fistula, the matter discharged by stool is not mixed with the fæces; on the contrary, they always appear distinct and separate; on minute investigation, some degree of hardness, swelling, or discoloration, is always discovered near to the
fundament;

fundament; and in this spot a considerable degree of pain always takes place from pressure.

Various means have been proposed in cases of occult fistula, for discovering the site of the abscess. By some we are advised to pass a curved probe up the rectum; and to search with the point of it, till the opening is discovered, when, by pushing it forward, it may pass into the abscess*: Others, again, advise a thick firm tent to be pushed into the rectum, so as to obstruct every means of communication between the sinus and gut; and by this they suppose, that the matter of the abscess may be made to collect in such quantities as evidently to point out its situation. Neither of these methods, however, are necessary, nor is it probable that they would often succeed.

Whenever an abscess is seated near to the verge of the anus, however small it may be, it may be easily discovered: For, some degree of hardness, a small tumefaction,

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* Vide Dionis—Course of Operations, Demonstr. IV.

faction, and most frequently some discoloration, is observed at some part contiguous to the extremity of the gut; and whenever this mark is perceived, and especially if pressure excites much pain, there will be no cause to doubt of this being the seat of the abscess.

In such circumstances, what are we to do? We ought here to have the same object in view, as if the matter had been discharged by an external opening: For the disease is in reality the same, and differs only in this single circumstance from the most frequent variety of fistula, that the matter is in this case first thrown into the rectum, before it can be discharged, instead of coming freely off by one or more external outlets near to the anus. And as the two varieties of the disease are very nearly the same, so the means necessary for their removal are very similar.

As soon as we have determined to perform the operation, the point of a lancet should be plunged into the tumified or discoloured spot; and upon the point of the
instrument

instrument reaching the abscess, which is at once known by a discharge of pus taking place, as the disease is thus reduced to the state of a simple, complete fistula, the operation is to be finished in the same manner as I have already advised for that variety of the disease; by the introduction of the finger of the left hand into the anus, passing the probe-pointed bistoury in at the wound newly made, and, on its point being discovered by the finger in the rectum, by drawing it out in such a manner as to divide the abscess or sinus through its whole length;—and the subsequent treatment of the fore is also the same as in other cases of fistula.

All that has been as yet said relates to the mildest and most simple stages of fistula; the parts chiefly affected being supposed to be in no other way diseased, than by having an abscess seated in them, either occult, or with one or more external sinuses running into it.—But when by neglect, or improper treatment, the matter collected in such abscesses does not
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find a free vent, the contiguous parts inflame, become painful, and in a gradual manner acquire much morbid hardness or callosity.

In such circumstances, various remedies have been advised: As a previous step to any operation, it has been proposed by some to dissolve this hardness or callosity, by the use of mercury, aided by suppurative or emollient poultices.—Others advise the hardened parts to be destroyed with caustic; but the opinion that has till of late most generally prevailed, is, that all the callous parts should be extirpated with the scalpel.

But whoever has had opportunities of becoming acquainted with this branch of practice, will know, that it is perfectly impossible to dissolve or dissipate any callosity that has been of long duration, either by poultices, mercurials, or other discutients; and it luckily happens, that a cure may in general be obtained by means of a more gentle nature than the destruction of the hardened parts, whether
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by caustic or extirpation: When the parts cannot be preserved but at the hazard of the patient's life, they ought undoubtedly to be removed; but as necessity alone should point out the propriety of such a painful and violent measure, it should never be advised when our views can be accomplished in a milder manner.

I have endeavoured to show, and indeed the fact is obvious to all who will be at the trouble of observing, that the callous state of the parts that often takes place where the disease has been of long duration, is uniformly the effect of the matter not finding a free vent, and of its being thereby forced to disperse among the contiguous muscles; by which, pain, inflammation, and hardness, are successively and necessarily produced.

If this is a true state of the matter, and all practitioners of experience will probably admit that it is so, it must be obvious that there can be no need of such violent remedies as those I have mentioned, namely, the removal of the diseased parts either with
caustic

caustic or the scalpel: The means of relief to be employed here, are merely such as will afford a free outlet to the matter, whilst they also serve to induce and preserve a discharge of matter in the substance of the diseased parts, and which I am inclined to consider as the most effectual method hitherto discovered for the removal of all such morbid callosities.

Through the whole of this chapter, I have avoided the use of the word Schirrus; and I am here particularly anxious to have it remarked, that I have done so: For in real schirrus, the remedy I have now pointed out, namely, the excitement of suppuration in the substance of the diseased parts, would probably prove highly pernicious, by forcing quickly forward to a state of cancer, a tumor, which, if left to itself, might possibly have remained indolent for a great length of time. It is therefore evident, that an accurate distinction between real schirrus, and o-
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ther hard tumors, is a point of much moment. Every hard tumor that from experience is known to be apt to degenerate into cancer, I would denominate Schirrus. Now we know well, that cancers very rarely attack tumors that are not glandular: So that to every indurated swelling of the cellular substance and other soft parts not evidently glandular, a different appellation should be given: All of these are perhaps with propriety enough denominated callous tumors.

Those hard tumefactions, therefore, seated in the cellular substance near the anus, as they never appear to degenerate into cancer, I have termed Callosities: The most effectual remedy that I have tried for the removal of these, is a free suppuration induced in them, and the most effectual method of effecting this is by laying every sinus that can be discovered, freely open from one end to the other; and when the sinuses are not numerous, it proves even useful to make one, two,
or

or more deep incisions along the whole extent of the induration. By carrying the incisions to the full depth of the indurations, such a plentiful flow of matter ensues to the inflammation that they induce at first, as commonly acts with much advantage in the cure.

Indeed none can imagine how highly beneficial this practice proves but those who have experienced the benefit that ensues from it: In various instances, I have known it succeed completely where the total removal of the diseased parts had previously been judged to be indispensable. Where the disease has been of long duration, the remedy must indeed be long persisted in; that is, a plentiful discharge of pus must be long preserved, either in the incisions first made, or, if these heal too quickly, in others made to succeed them.

In some instances, these incisions do not easily suppurate; their edges inflame, become painful, and discharge a thin fetid

tid matter. When this proceeds from lues venerea, or any other disease of the constitution, this must be first removed, before the incisions will yield good matter. But when the system is otherwise healthy, and when there is therefore reason to imagine that the untoward state of the fores proceeds merely from irritation or some other local affection, in such circumstances, warm poultices prove highly useful: By their emollient properties, they tend to remove irritation with more effect than any other remedy; and I have elsewhere shown, that nothing acts with such certainty in the formation of good pus.

In every case, therefore, of fistula, attended with much hardness and tumefaction of the contiguous parts; instead of removing the hardened parts either with caustic or the knife, the practice I would advise is this:—The sinus or fistula should be treated in the same manner as if no hardness existed; that is, it should be laid freely open from one end to the other:

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If more sinuses are discovered, these should also be laid open; and if the hardness in the contiguous parts extends either laterally, or in any other direction beyond the course of the sinuses, one or more deep incisions should be made along the whole length of it: And by preserving these incisions in a suppurative state till the hardness is dissolved, they may then be allowed to heal from the bottom in the same manner with wounds or ulcers induced by any other cause.

By this management alone, when the constitution is otherwise healthy, the very worst variety of fistula may be cured with more certainty, and with much more comfort to the patient, than by the extirpation of the hardened parts. Indeed scarcely any case, I think, can occur, of the parts being in such a state as to render it proper to remove them, if they have not been long and almost entirely separated from the subjacent muscles, with which, in a healthy state, they ought to be connected. This, again, can never
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take place but from very gross mismanagement: When we do, however, meet with it, and when the hardened parts are so much detached from the others, that they would not probably adhere again, necessity points out the propriety of cutting them off; and in external ulcerations of these parts, when the edges of the sores have become hard and reversed, the cure may be promoted by removing the diseased parts; but in no other instance ought this practice to be attempted; for all the advantages said to be derived from it, may be obtained with much more ease and safety from the method of cure I have here pointed out.

The only other symptoms connected with fistula in ano to which I have not yet adverted, are such as arise from affections of deep-seated parts; namely, such as proceed from disease of the os coccyx, os sacrum, bladder, and parts about the loins.

It sometimes happens, that the matter collected in fistulous sores about the anus,

by being allowed to spread among the neighbouring parts, comes at last even to injure the bones themselves; but instances likewise occur of diseases of the bones being the primary affection, and of its giving rise to, instead of being produced by, sinuses about the rectum. Thus, collections of matter on the psoæ muscles, originating, in some instances, from carries of the lumbar vertebræ, instead of falling down and pointing, as they commonly do, in the upper and fore part of the thigh, are sometimes found to follow the course of the intestines, and to discharge their contents at the side of the rectum. A severe bruise, too, upon the hips and contiguous parts, by injuring the os coccyx, has, in some instances, produced the same effect.

But the most distressful circumstance that ever accompanies fistula in ano, is the formation of a passage between the rectum and bladder. This sometimes happens indeed, where no sinus or abscess had previously appeared about the anus.

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but it more frequently succeeds to ulcerations in these parts, and by these being improperly treated, than to any other cause. The symptoms by which the existence of this dreadful malady is with most certainty known, are, in the first place, an unusual, dark brown, thick sediment, being observed in the urine, which by degrees becomes of a darker colour, and of a more offensive fæcal smell; air is frequently discharged in considerable quantities by the urethra both before and after voiding urine; and in the latter stages of the disease, the urine does not get a free vent from the bladder.

The existence of these symptoms, serve sufficiently to ascertain the nature of the disease; but hitherto we have not been able to discover any means of removing it. So that all who have yet been attacked with it have at last fallen victims, after dragging on, twelve, eighteen months, or perhaps two years, of a very miserable existence.

In the event of any of the bones of the coccyx, sacrum, or lumbar vertebræ becoming carious, from the matter in this disease having been allowed to penetrate and to corrode them, all that art can do is to preserve a free vent for the discharge; to keep the parts clean; to extract any pieces of loose bone that may be discovered; and to strengthen the constitution by a nourishing regimen, with a view to enable it to support the long-continued discharge to which it may probably be exposed: Some few have in such circumstances, and with such a plan of management, been fortunate enough to obtain cures, by such pieces of bone as were spoiled being at last thrown off, and by the parts being then induced to heal. This, it must be confessed, however, is a rare occurrence; and all that, in this situation, we have reason to expect, is to be able to palliate the most distressful symptoms.

I have thus concluded what it was my intention to offer on the fistula in ano;
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and as it is a very distressful as well as a frequent disease, and especially as it was never till of late described with accuracy, I have hence been induced to consider it more minutely than I otherwise should have done. What I have endeavoured to show, and to which I still wish to excite the attention of the younger part of the profession, is, that a sinus or fistula, is a disease of the very same nature in the neighbourhood of the anus, as in any other part of the body; and therefore, that the method of cure ought to proceed upon the same principles here as in similar affections of other parts. Till the late improvements made in the treatment of this disease, and till the true nature of it was understood, much confusion subsisted in the method of conducting the cure. Except in the most trifling cases of superficial sinuses, it was never imagined that a simple incision could answer: Nothing less than a total destruction or removal of the diseased parts was supposed to be sufficient.

But it will now, I hope, appear, that this is very rarely necessary; and when a cure is practicable, that it will be more readily accomplished by the means I have pointed out, namely, by a mere division of the sinuses, than by any other that has yet been proposed. It will sometimes happen, indeed, that, in cases of an inveterate nature, none of the means that I have mentioned will succeed; but, in all such cases, no advantage would be derived from more violent remedies, and much distress would certainly be induced by them.

I have already observed that the best form of knife that I have yet seen for fistula in ano, is one or other of the bistouries, delineated in Plate LXIV. Those not accustomed to use this bistoury, are apt indeed to suppose, that it cannot penetrate the rectum but with much risk of injury to the finger previously passed into the gut; but this is so far from being the case, that in none of the cases in which I have operated,

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ted, and they now amount to some hundreds, has my finger ever been cut: With a view, however, to obviate this difficulty, a very neat and simple invention has for some years past been used by many, and of which I have given a figure in Plate LXXX. fig. 2. and 3. and the mode of applying it will be seen in the explanation of the Plate. The probe-pointed bistoury, however, when properly formed, divides the gut in a great proportion of cases with perfect ease, and with no hazard, as I have endeavoured to shew either to the patient or operator; but where the parts meant to be cut are of considerable thickness, as is the case when the sinus does not run contiguous to the rectum, I have sometimes found it difficult to perform the operation with a bistoury of any form. The difficulty, however, does not consist in passing the instrument from the sinus into the rectum, which with the common crooked bistoury is in every case easily done if the probe-pointed part of it is properly made, but in

turning the point of it down, so as to divide the parts from the opening at which it entered, to the under part of the gut: By cutting slowly and deliberately, I have always been able to do it; but in one case, a bistoury of considerable strength broke while I was making the cut; and in different instances I have known this happen with others: This has made me wish to have an instrument for this operation still more perfect than the bistoury: Many have been proposed, but none that has yet appeared answer so well as the bistoury: I am at present using scissars of a particular construction; but I cannot as yet speak of them with such certainty from experience, as to render it proper to lay them before the public, which, however, I shall do at some future period, if the trials that I mean to give them shall justify the opinion I have formed of them: I may here, however, shortly observe, that they consist of two cutting blades, which after being introduced

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ced separately, the one into the sinus, and the other on the finger previously passed into the rectum, are joined at their axis by a moveable pin, in which state being able to act like common scissars, the operation is finished by a single cut.

CHAP.

CHAPTER XXXIX.

Of FRACTURES.

SECTION I.

General Observations on Fractures.

SOME practitioners denominate every solution of continuity in a bone a Fracture; but the term may, with more propriety, be confined to divisions in bones produced by external violence. Thus, we do not say that a bone is fractured, the

the parts of which are separated from each other by the effect of internal disease; while we say that it is fractured when this happens from a fall, a blow, or a bruise.

Fractures are of various kinds, and are distinguished by different names. A bone may be fractured either directly across; in an oblique direction; or longitudinally: Hence the terms, *Tranverse*, *Oblique*, and *Longitudinal Fractures*. When a bone is split, we say that it is *Splintered*.

When the teguments remain sound, a fracture of a bone is denominated *Simple*; and we term it *Compound* when the fracture communicates with a wound in the skin and other corresponding soft parts. By some a fracture is said to be *Compound* when a bone is broken into different parts; and those Fractures they term *Complicated*, that are accompanied with wounds in the corresponding soft parts. This subdivision, however, of fractures, seems to be unnecessary: For unless a bone is splintered, no essential difference

difference arises merely from its being broken at one or two parts; whereas the slightest communication between a fracture and a wound in the surrounding soft parts, changes the nature of it so entirely, as often to induce much danger where no alarming symptoms would otherwise have been dreaded.

The existence of fracture is, for the most part, easily discovered, by manual examination. A fracture of a single bone, where there is only one in the fractured limb, and the fracture of both bones when there are two, as well as fractures accompanied with extensive wounds of the contiguous soft parts, are easily discovered: But in simple fractures, where only one bone of a limb has suffered, it is often difficult to judge with any degree of precision; particularly where the contiguous parts have become tense and painful. In such cases, our opinion must be formed by a minute attention to different circumstances; the age and habit of body of the patient; the site of the supposed

fed fracture; the situation of the limb when the injury was received; and, lastly, the attending symptoms.

In old age, bones are more easily fractured than in earlier periods of life. In infancy, bones will rather yield than break on the application of a moderate force; whilst in old age they become so brittle, that even the largest are frequently broken by very trifling falls and bruises.

Different diseases induce this brittle state of the bones; particularly lues venerea. Of this I have met with various instances. In some of these, the largest and hardest bones were broken, solely by the ordinary action of the muscles of the limb. This I have also known happen in sea-scurvy: Bones that have been fractured and long united are apt to separate in advanced stages of scurvy, the callus being either dissolved or rendered too soft for the purpose of retaining them together.

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Besides these general diseases of the body, the bones themselves are liable to a disease that renders them soft and flexible. This is usually termed *Mollities Ossium*. In some, this goes no farther than to produce that state of the bones I have mentioned, in which they are apt to be fractured by slight falls and similar accidents: But in others, it has been known to proceed to such a height, that every bone in the body has become crooked and distorted. I have seen a skeleton in which the condyles of the knee-joints were turned up so as to touch the pubes, and in which every other bone was crooked in nearly a similar degree.

In judging therefore of the probability of a fracture from the degree of violence applied, these circumstances merit attention: For it is evident, that in old age, and in these diseased states of bones, a degree of force will produce fracture, which in other circumstances it could not possibly do.

The site of a supposed fracture is also to be taken into consideration. Bones are more apt to be broken in those places where they are hard and brittle, as in the firmer parts of all the long bones, than towards their extremities, where they are of a more soft and yielding texture; and bones that lie deep under the cover and protection of muscular parts, as in the thighs, are not so frequently fractured as those of the arms and legs, that are not so well protected.

Further, the situation of a limb when an injury is inflicted, is an object of enquiry. Thus, a very inconsiderable weight passing over a bone lying on an unequal surface, will readily produce a fracture; while the same bone, equally supported, will bear a heavy load without being much injured.

In forming an opinion of the probability of a bone being broken, we ought, lastly, to take into consideration the symptoms that usually accompany fractures. These are, pain, swelling, and

tension.

tension in the contiguous parts; a more or less crooked and distorted state of the limb; a crackling or grating noise on the parts being handled; and loss of power to a certain degree in the injured limb.

It is true, that the mere fracture of a bone is not necessarily attended with much pain; for the bones, not being so plentifully supplied with nerves as the softer parts of the body, they are therefore of a less irritable nature. But pain arises from two circumstances with which fractures are usually attended; the contiguous soft parts being bruised and otherwise hurt, in the first place by the force producing the injury, and afterwards by the displaced ends of the bones. For the most part the pain indeed is not very severe: But in some it is so violent as to induce the most alarming symptoms; spasmodic twitchings of the muscles of the limb; high degrees of inflammation; fever; general convulsions and delirium; and if the cause by which these symptoms are induced be not soon obviated,

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they sometimes even terminate in death. In general this is preceded by mortification of the parts contiguous to the fracture; but in some these symptoms prove fatal, without any tendency to gangrene being perceived.

When the force by which a fracture is produced has been extensively applied over a limb, we may readily suppose that the severest symptoms may be induced by this cause alone; but in general we find, when the pain, tension, and convulsive twitchings of the muscles are severe, that they chiefly arise from the adjoining membranes, muscles, and other soft parts being torn, punctured, or compressed by the ends of the fractured bones: And although this may happen in fractures of every description, yet it will necessarily be more frequent in those that are so oblique as to admit of the bones passing easily over each other, than in transverse fractures, where the parts, on being replaced, more readily remain in their natural situation.

The other diagnostic symptoms of fracture that I enumerated, namely, a grating noise on the parts being handled, and distortion and loss of power to a certain degree in the injured limb, must necessarily take place in every fracture. They are indeed much more evident in some fractures than in others: But in all they may be discovered where the parts are not much swelled, excepting in the case of a longitudinal or splintered fracture. A bone may be split in this direction without any of these symptoms taking place: For unless the divided parts be completely separated from each other, neither distortion nor crackling will be perceived on handling them; nor will the bone be rendered altogether incapable of performing its usual functions. In such cases, we judge of the probability of a fracture, from the violence of the injury, the severity of the symptoms, and other circumstances already enumerated.

Besides these leading symptoms of fractures that take place immediately on the

injury being inflicted, there are others which occasionally take place from the first, and some that we are to consider as consequences rather than symptoms. Of the first, the most remarkable are, that great degree of ecchymosis which in some cases appears instantaneously, from the ends of a fractured bone having penetrated a contiguous artery or vein; and the wound or laceration of the teguments in compound fractures.

The most important consequences of fractures are, stiffness and immobility of the injured limb; distortion of the parts chiefly affected, either from a fulness or thickness remaining in the contiguous muscles or ligaments; an exuberancy of callus; a contracted state of the contiguous joints; or a marasmus or wasting of the limb itself. All these we shall consider more particularly in speaking of the treatment of fractures.

In judging of a fracture, and of the probable event of it, various circumstances are to be considered: Particularly the

age and habit of body of the patient; the situation of the bone, and the part of it that is injured; the nature of the attending symptoms; the circumstances with which the fracture may be complicated; and the kind of fracture.

With respect to the first of these, namely, the age and habit of body of the patient, we all know that they are points of much importance in the cure of every injury; and in none more than in fractures. Thus in youth, particularly in infancy, fractures are more quickly cured than in old age; and in sound constitutions, more readily than in those that are diseased. I have observed above, that the bones sometimes become brittle in lues venerea; and it may here be remarked, that the existence of lues venerea, and scurvy, is particularly adverse to the reunion of fractured parts. I have met with some exceptions to this, where fractures have united readily even in advanced stages of lues venerea: But this is uncommon; and where lues venerea has

attacked the bones, a firm callus seldom forms till the virus is eradicated.

In speaking of the effect of age on the cure of fractures, although I admit that the divided parts of bones unite more speedily in infancy than in old age, yet I think it right to remark, that they do not reunite with more certainty. By many we are told, that in advanced periods of life the union of fractured bones is often not to be accomplished. I have never, however, seen an instance of this, although I have had the management of many fractures even in extreme old age.

The situation and part of the injured bone, are both circumstances that merit attention. Thus we know, that fractures of the small bones of the arms and legs, of the feet and hands, and of the ribs, in general heal easily ; while fractures of the larger bones, particularly of the femur and humerus, are managed with more difficulty. In the last, indeed, one principal cause of the cure proving tedious,

is the difficulty of retaining the ends of the bone together.

When any of the large bones are fractured near to their extremities, we find the danger greater, and the prospect of a complete cure much less, than when they are broken near to their middle: For here the shortness of one end of the bone makes the retention difficult; and the symptoms that ensue from fractures in this situation are apt to be particularly severe, not only from the contiguity of the capsular ligaments of the joints, which may thus be injured, but from the numerous tendons inserted into these parts of the bones; which may not only be lacerated and bruised, but even torn from their insertions. Besides, the ends of bones are not only soft, but even spongy or cellular in their texture, by which fractures in these parts do not unite so equally; the parts more frequently exfoliate, and matter is more apt to form in them: Hence when fractured they are more tedious in the cure, and give rise to more

troublesome symptoms, than similar accidents in the harder parts of bones.

It is also proper to remark, that fractures near the extremities of bones are frequently productive of stiff immoveable joints, unwieldy limbs, pains and swellings; which, in various instances, even under the best treatment, continue obstinate for a great length of time, and in some cases even during the life of the patient.

We are in general led to suppose, that these consequences arise solely from mismanagement, either on the part of the surgeon or of the patient. That in some instances this is the case, no person will doubt. The ends of a fractured bone may be improperly placed from the first by the practitioner, or they may be afterwards misplaced by the patient; and in either case we may conceive that all the symptoms I have mentioned will take place. But in justice to the profession, I must observe, that they more frequently arise from the situation and nature of

of the fracture than from any other cause. Nor is it surprising that it should be so. When we consider the various circumstances with which fractures are often accompanied; the degree of violence required to break a large bone; the severe contusion of the contiguous soft parts which this must produce; and the laceration of nerves, muscles, and ligaments, that must occur from the spiculæ of fractured bones; we should rather expect that they would more frequently induce distressful consequences than we actually find to be the case.

In forming a judgment of the nature and probable event of fractures, the symptoms merit particular attention. If the symptoms are moderate, when compared with the violence that the parts have suffered, our prognosis should be proportionally favourable: But when the attending symptoms are severe, particularly if the pain is uncommonly violent, and the swelling and tension considerable, however trifling the force may have been
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by which the fracture was produced, the case will probably be difficult to manage, and uncertain in the event. In such circumstances, therefore, even in simple fractures, our prognosis should be guarded.

The circumstances with which a fracture may be complicated, are likewise of importance; and unless they are duly weighed, no accurate judgment can be formed of the event. The contiguous muscles and other soft parts may be severely contused; some of the ligaments and tendons of the injured part may be ruptured, or even torn from their insertions; and the fracture may be combined with a dislocation of one or both of the contiguous joints. These accidents in every instance aggravate the danger.

The last consideration on this subject respects the kind of fracture. The greatest difference is observed between the event of a simple and of a compound fracture. A great proportion of cases of simple fracture are of a mild nature from
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the first; and with very ordinary attention complete cures are obtained: But in compound fractures, the smallest external wound communicating with the injury in the bone, will often produce the greatest danger. I do not mean to say that this always happens; on the contrary, we know that even the worst cases of compound fractures will, with proper attention, often terminate in a favourable manner: But every practitioner versant in this branch of business, will allow, that this is seldom the case; and that even under the best management such cases are so apt to go wrong, as to warrant the opinion that I have given of them, and to render it proper in almost every instance to give a guarded prognosis.

Various indications have been proposed for the cure of fractures; and these we are desired to have particularly in view, are, extension; counter extension; coaptation, or replacement of the fractured parts; deligation, in so far as is necessary for retaining them; position of
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the injured part; and prevention or removal of bad symptoms.

The subject, however, may be simplified, and the indications with propriety restricted to three: To replace the parts of the bone that have been moved from their natural situation; to retain them in this situation as long as may be necessary; and to obviate such symptoms as may supervene during the cure.

In some few favourable cases, where the bones are fractured directly across, they are either not moved out of their natural situation, or the alteration is so inconsiderable that they are easily replaced. But when the bones of a limb are broken in an oblique direction, they are apt to pass one another so as to produce much deformity and pain. The contiguous muscles are thus severely injured, and excited to violent action: Hence the malady is increased by every exertion; and nothing will remove it but an artificial replacement of the distorted bones.

To accomplish this, various methods have been proposed. In former times it was done by much violence and force; by what was termed Extension and Counter Extension: But we now know that our purpose may be accomplished in an easier manner, with less pain to the patient, and less trouble to the operator.

As long as it was imagined that much force was necessary, the limb was extended by one or more assistants pulling at each end of it; and when this was not sufficient, different machines were employed for it. This force was in general applied while the limb was stretched out or extended, by which it became much more difficult to reduce the displaced ends of the bone: For in this manner all the contiguous muscles were put into action; nor could the bones be replaced till this was overcome by the application of a superior force. The mischief that this would often produce, it is easier to imagine than express.

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When it is considered, that in the reduction of fractured bones the chief resistance arises from the action of the corresponding muscles, the propriety of placing the limb in such a posture, during the operation, as may favour the relaxation of these muscles, is so evident, that we now reflect with surprise, that it should have been left to the practitioners of the present age to propose it. For, whatever may have been the opinion of a few, it is certain, that till lately it was the general practice to keep every limb in an extended position while any attempt was making to replace the fractured bones, and that it is chiefly to the late Mr Pott we owe the present improved state of this important branch of surgical practice.

If in the treatment of fractures, we take care to relax all the muscles of the limb, it is surprising with what ease the ends of the bones may in general be replaced. When a limb is laid completely in this relaxed posture, the surgeon will in most cases be able to replace the bones
without

without any assistance: But when this does not succeed, a slight degree of extension may be employed, by the upper part of the limb being kept firm by one assistant with his hands placed between the fracture and the contiguous joint, while the under part of it is gently extended by another; care being still taken, however, to keep the muscles as much relaxed as possible.

As it is of the utmost importance in replacing the fractured parts of a bone to do it with exactness, the most minute attention should be given to this part of the operation. Every inequality depending upon any portion of a displaced bone, should, as much as possible, be removed, so as to render the injured part similar to the corresponding sound limb; which, for the purpose of a more attentive examination, should be placed as near to it as the conveniency of the operator will permit.

The necessity of attention to this part of the treatment will appear from this,

this, that when the fractured bones are not properly reduced at first, the limb must either remain always distorted, or be put right during a future stage of the cure, when it will necessarily be done with more pain to the patient, and more trouble and perplexity to the surgeon.

The bones being put right, our next object is to retain them as long as may be necessary in this situation. This we do with splints and bandages, and placing the limb in such a state of relaxation as will admit of its resting with ease, and without being disturbed, till the cure is completed. In treating of fractures of particular bones, the posture in which they should be placed, and the bandages best adapted for their retention will be described. I may merely observe at present, that no bandage should be more tightly applied than merely to retain the bones in their situation; and that this may, for the most part, be easily done, if the limb is kept in a relaxèd posture.

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The time required for the firm re-union of fractured bones depends upon various circumstances: Upon the size of the bone, and the weight that it has to support; on the age and habit of body of the patient; and on the cure having proceeded with more or less interruption, from the limb having been kept more or less steadily in its situation, as well as from the attending symptoms of swelling, pain, and inflammation, having been mild or severe. In a healthy middle-aged patient, where no untoward symptoms have occurred, and when the injured parts have been retained exactly in their situation, a cure of a fractured femur, or of the bones of the leg, will be accomplished in two months; of the humerus and bones of the fore-arm, in six weeks; of the calvicles, ribs and bones of the fingers and toes, hands and feet, in three weeks. In infancy and childhood, fractures in all these parts heal more quickly, while in old age this uniting

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process goes on more slowly, and therefore requires more time to accomplish.

In simple fractures, to which these general observations more particularly apply, the pain, tension, and other symptoms, are in general moderate, and usually subside entirely in the course of a few days, if the bones are properly retained in their situation; but in some cases, instead of diminishing, they become daily more violent, so as to be productive of much distress to the patient, as well as trouble and embarrassment to the practitioner.

When the muscles and other soft parts of the limb have not been much contused, no remedy should be advised merely with a view to the prevention either of tension or pain: But when much violence has been done to the limbs, these symptoms should be guarded against by the early use of astringent applications, such as solutions of saccharum saturni, of crude sal ammoniac, and spiritus Mindereri; and when these fail, by a free application
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of leeches over the injured parts. Indeed, the practice of taking away blood by leeches proves in every instance so highly useful, that I always advise it when the tension is considerable, or whenever the pain continues severe after the bones have been replaced. In all fractures, inflammation is the symptom which, in the first place, we have most reason to dread; and as nothing tends with such certainty to prevent or remove it as local blood-letting, it should never be omitted at first when the surrounding soft parts are much injured: Nor should it afterwards be delayed when it appears to be necessary; for this remedy proves always most effectual when employed early.

Besides the immediate advantage of relieving the pain in the injured part, nothing prevents with such certainty the troublesome consequences of contusion in cases of fracture as the early application of leeches. Of these consequences, the most remarkable are, deep-seated abscesses, which in some instances form

within the cavity of the bone itself, and in others in the surrounding cellular substance; long continued pains, resembling rheumatism, stretching over the injured limb; a thickened enlarged state of the periosteum and other soft parts; a stiff contracted state of the contiguous tendons; an exuberancy of callus; and an unwieldy state of the whole member.

It is well known to every surgeon of experience, that all of these consequences are apt to succeed to fractures accompanied with much contusion: And nothing proves more perplexing to surgeons, or more distressful to patients; for when they are not soon removed, they are very apt to prove permanent; and for the most part this is laid to the charge of mismanagement in the reduction of the fracture.

In many instances these consequences no doubt proceed from the extremities of the fractured bone not being properly replaced, or not retained with exactness afterwards: But they more frequently
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proceed from the inflammation that succeeds to contusion. It is therefore evident, that early local blood-letting must always prove useful. When swelling and pain in a fractured limb have continued long, the most effectual relief is obtained from frictions with emollient oils, and from tepid bathing in warm sea-water, and in the waters of Buxton, Bath, and Barreges. But in the early stages of fractures, nothing removes the pain with such certainty as a plentiful discharge of blood from the injured parts.

We are sometimes disappointed in the cure of fractures, by the limbs remaining unseemly from an over-growth of callus. This is not indeed a frequent occurrence, but every practitioner must have met with it: Being most apt to take place where the symptoms of inflammation have been severe, I have regularly ordered local blood-letting, for the prevention and removal of this exuberancy of callus, and commonly with much advantage; but in some cases the tendency to form callus is so great that it

can scarcely be checked. The application of ardent spirits, and other astringents, is here supposed to prove useful; and I have in some instances derived advantage from a continued gentle pressure, which is best applied by means of a thin plate of lead adapted to the form of the part, and retained with a proper bandage: But as neither this nor any other remedy will prove successful in every case, and as patients are apt to regret nothing so much as a disappointment in obtaining a complete cure of a fracture, our safest course, as soon as the callus begins to be luxuriant, is to acquaint the patient with the probable event; and he must be very unreasonable indeed, if he afterwards repines at what the utmost care and attention could not prevent.

Among the consequences that sometimes result from fractures, there is one that merits more particular consideration, namely, the difficulty of obtaining an union between the ends of the fractured bones, by which they remain loose and detached

detached long after they should have been firmly united.

This may proceed from various causes: From constitutional diseases, such as rickets, scurvy, or lues venerea; from the ends of the fractured bones not being kept steadily in contact till completely united; from a portion of a muscle, tendon, or ligament, falling between the ends of the fractured parts, so as to prevent them from being placed in contact; and in some, from a bone being broken in different parts, and the intermediate detached pieces being so small as to prevent them from adhering, even when kept in close contact.

It has been observed, too, that a state of pregnancy proves inimical to the recovery of fractured bones. This has not indeed fallen within my observation; but it appears to be the general opinion of practitioners, and different instances of it are upon record.

When this want of union proceeds from any general disease of the system, this

disease must be removed by the remedies that experience has shewn to prove most effectual; for no attention on the part of the surgeon will be of any avail till this is accomplished; and as much mischief is often prevented by an early application of remedies, they should always be advised as soon as the cause is found to exist. It would even be a prudent precaution, where a patient at the time of receiving a fracture is known to labour under any constitutional disease, to advise an immediate application of remedies; by which means cures might be often quickly accomplished, which otherwise might be protracted to a great length.

When a cure is interrupted by the fractured ends of the bones not being kept in a proper situation, the bones should be replaced and retained with as much exactness as possible; and when the injury is still recent, often, indeed, for the space of two or three weeks, a perfect union may thus be accomplished.

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But where fractured bones have remained for any considerable length of time disunited, the osseous matter by which they should have been knit together becomes hard, smooth, and totally unfit for the purpose, in so much that no advantage could be derived from their being replaced. Of this I have met with various instances, where the ends of the fractured bones were become perfectly smooth, and moved on each other with nearly the same ease and freedom as the bones of any of the joints.

In this situation, when the inconvenience with which it is attended, is not great, the patient should be advised to submit to it, particularly in fractures of the small bones, such as those of the fingers and toes, the bones of the metacarpus and metatarsus, the clavicles, and ribs : But in the large bones of the extremities, where much firmness is required, and where this kind of injury destroys the use of the limb, as we may be able by an operation to restore it, we ought perhaps

perhaps in every instance to propose it. By making an incision through the surrounding soft parts, so as to lay the ends of the bones bare, and removing a small portion of each of them either with a common saw, or with the head of a trepan, we reduce them to the state of a recent fracture; when, by taking care to retain them in a proper situation, we may in due time accomplish a cure.

The operation is no doubt painful and tedious: For the incision must be extensive, in order to admit of a free application of the instruments; and it requires to be conducted with caution, that the large blood-vessels of the limb may be avoided: But it may be done with perfect safety by any person accustomed to the operative part of surgery*.

Nor should we be deterred from proposing this method of cure, from any apprehension about the vacancy that may be produced by the removal of the ends of

* Vide White's Cases in Surgery, where two instances of this are recorded

of the bones : For if the limb is kept steadily in its situation, and if the constitution is healthy, nature will not probably fail in supplying the deficiency. Thus many instances are upon record, even of entire bones being regenerated ; and, in a lesser degree, the powers of nature on this point must have fallen within the observation of every practitioner.

A bone is often broken in different parts, and a cure notwithstanding obtained : But when the detached parts are so small that the circulation will not probably be kept up in them, as they will thus be rendered incapable of furnishing the secretion by which their reunion should be accomplished, it would be better to remove them at once, than to impede the cure by any attempt to save them. Accordingly, in all compound fractures, where the injured bone is already laid bare, it is the best practice to remove all such detached portions as might not probably unite with the remaining parts of the bone. But in simple fractures,

fractures, where the skin remains entire, as we cannot judge with such certainty of the nature and extent of the injury, nor of the probability of our being able to preserve the loose portions of bone, we should endeavour in the first place to accomplish a cure in the easiest manner, by placing the parts in such a position as will most readily admit of their reunion: But when this does not succeed, when the ends of the bone remain loose long after they should have been united, and if one or more detached pieces are discovered, these are to be considered as extraneous bodies, and ought accordingly to be removed either with the fingers or forceps, at an opening made through the soft parts for this purpose.

Experience enables me to recommend this practice with confidence. I have met with various cases in which cures were judged to be impracticable, from no union being formed between the ends of bones that had been long fractured,

red, and in which I proved successful at last, by the removal of some loose fragments.

But the most perplexing cause of failure in the treatment of fractured bones, is a portion of a muscle, ligament, or some other soft part passing between them. We judge that this is the case when the pain and tension of the injured part have been more severe than usual from the first; when particular movements of the limb occasion severe pain and twitchings of the muscles that serve to move it; and when the ends of the fractured bone do not unite at the usual time.

As soon as there is reason to think that the cure is prevented by this cause, we should endeavour to remove the portion of interposing membrane or muscle, by putting the limb into every variety of posture. But when this does not succeed, as will often be the case, and when the bones still remain loose long after the usual period, we ought, without farther hesitation, to make an incision upon the fractured

fractured part. When the injury has not been of long duration, a cure will be accomplished merely by bringing the ends of the fractured bone into contact: But when this measure has been long delayed, and when the osseous matter poured out by the fractured extremities of the bone has become hard, a small part of it should be removed either with a saw or some sharp instrument, so as to convert the injury once more into the state of a recent fracture; otherwise no advantage will be gained by the operation.

Besides these causes that I have mentioned, which tend to impede the cure of fractures, it may not be improper to remark, that the effusion of much blood round the injured bone is very apt to do harm. In cases of simple fracture, the larger blood-vessels are seldom injured; and blood effused from small arteries is for the most part soon absorbed, and no bad consequences ensue from it. But instances sometimes occur, even in simple fractures, of large blood-vessels being cut by
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the sharp spiculæ of the bone. When the quantity of blood thrown out is considerable, the tumefaction of the limb becomes so great, that it is necessary to lay it open in order to secure the injured vessel with a ligature : But where the swelling does not arrive at any alarming height, we rather trust to the natural contractility of the artery, for stopping the hemorrhagy, and to the powers of the absorbents for removing the blood already effused. In some such cases, where blood has remained long in contact with a fractured bone, the power of forming callus appears to have been destroyed by it ; the periosteum separates for a considerable space from each end of the bone ; and on laying the parts open, no union is found to have taken place ; the spiculæ produced by the fracture remain equally sharp as at first ; and, for the most part, a thin fetid sanies is discharged from the fore.

In this situation, a cure will not be obtained till those parts of the bone which have been denuded of the periosteum have
exfoliated ;

exfoliated, and, as exfoliation is in general a tedious process, I would rather advise the removal of the denuded bone with a saw; by which a more expeditious and more certain cure would be obtained.

Having premised these general observations, we proceed to the consideration of fractures of particular bones.

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SECTION. II.

Of Fractures of the Nose.

THE arch formed by the bones of the nose prevents them from being so frequently fractured as they otherwise would be. They are necessarily, however, liable to every variety of fracture when exposed to much violence.

Besides the usual symptoms of fractures, injuries of this kind in the bones of the nose are apt to impede respiration; they hurt the speech and sense of smelling; polypi and tedious ulcers sometimes ensue from them; and they are more hazardous than fractures of other bones from their contiguity to the brain. These fractures therefore require very accurate attention.

When we have ascertained the nature and extent of the fracture, our next object is to replace with as much accuracy as possible, such parts of the bones as are displaced. When any part of them has been raised above the level of the rest, it must be pressed into its situation with the fingers; while such parts of them as may have been forced into either of the nostrils must be elevated with the end of a narrow spatula, or any other instrument of a similar form. Any portion of bone that is quite loose, and nearly separated from the rest, should be removed immediately, whether it be raised up or forced into the nostril; but whatever adheres firmly to the remaining portion of bone should be replaced.

If the bones be properly replaced, they will for the most part remain in their situation without assistance. If the soft parts have been injured, they must be dressed in the usual way; and whether they are hurt or not, we should endeavour to prevent inflammation by the use of saturnine applications,

plications, and by local blood-letting when the violence of symptoms seems to require it.

But when the parts that have been replaced do not remain firm in their situation, something must be done to retain them. If they fall into the nostrils, we succeed best by the introduction of tubes of such a size into them as may preserve the fractured bones in their situation. The form and size of these tubes are delineated in Plate XXX. fig. 2. If the tubes are covered with soft lint, spread with any emollient ointment, they may be kept in the nostrils as long as is necessary: While, on the contrary, if any part of the bone is raised above the rest, it must be kept down by a proper application of a double-headed roller. If the teguments are injured, the sore must be first dressed; care being taken in doing it to prevent deformity as much as possible: A compress of soft old linen must be next applied; and over the whole an equal pressure with the bandage I have just mentioned.

In this manner a cure may be obtained of almost every injury of this part, unless the bones have been so much shattered, that their reunion cannot be accomplished. In which event, all that art can do is to extract the detached pieces, and to co-operate as much as possible with nature in healing the remaining fore.

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SECTION III.

Of Fractures of the Bones of the Face.

WHEN treating of fractures of the skull, in Chapter X. those of the upper part of the face were considered. At present, therefore, I have only a few observations to offer on fractures of the superior maxillary and cheek-bones, being those which form the most prominent parts of the sides of the face.

The vicinity of those bones to the eyes and nose, and the situation of the antrum maxillare, make fractures in this part highly important. When fractures stretch toward the eyes, they are apt to induce severe degrees of inflammation; and when they penetrate the antrum, they not only prove extremely tedious, but commonly occasion much deformity: For when the anterior part of that cavity is laid open, and any portion of the bone removed, the face becomes flat, and the teguments puckered, notwithstanding all that can be done to prevent it.

In all such injuries, therefore, we should with the greatest care replace any portion of bone that may be fractured, so as to favour its reunion with the rest; and any wound that accompanies the fracture should be dressed with much attention, that deformity, as far as possible, may be prevented.

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After the bones are replaced, which may be done with the fingers where there is no wound, and with forceps or a narrow spatula when the parts are laid open, a piece of adhesive plaster will answer better than any bandage for retaining the dressings. Blood-letting, and an antiphlogistic regimen, must be advised to obviate inflammation of the eye or contiguous parts, which otherwise might ensue. The remaining part of the cure, namely, the reunion of the fractured parts of the bone, must be left entirely to nature.

When a fracture penetrates the antrum, the matter which collects in that cavity cannot be properly evacuated from any opening that may take place on the prominent part of the cheek. In consequence of this, I have known sinuous ulcers formed that have continued open for a great number of years. They can only be healed by giving a free vent

to the matter, by an opening made in the most depending part of the cavity, in the manner I have advised in Chapter XIV. Section V.

SEC.

SECTION IV.

Of Fractures of the inferior Maxillary Bones.

ALTHOUGH the bones of the under jaws are very strong and compact, yet fractures of one, or even of both, are not unfrequent. This seems to arise from blows and other injuries to which these bones are exposed, being most apt to fall upon their anterior flat surfaces, where they are less capable of resisting violence than in any other part.

We judge of the existence of a fracture in the jaw, by the deformity that it occasions; by the crackling of the bone when handled; by inability to move the jaw; by the violence of the injury, and
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degree of pain with which it is accompanied.—When both jaws are broken, the injury becomes obvious; as in this case a considerable separation takes place at the fractured part: But even where one bone only is fractured, it may always with due attention be discovered.

The site of the fracture being ascertained, our next object is to replace the bones with as much care as possible: This we do by placing the patient in a proper light, having his head firmly secured, and the fingers of one hand pressing upon the inside of the jaw, while the other hand is employed externally in removing any perceptible inequality of the bone. One of the teeth is commonly seated in the course of the fracture; and in this situation acting as an extraneous body, and thus tending to retard the cure, it should be a general rule to take it out immediately: But when any of the teeth not seated in the course of the fracture, are forced out of their sockets, it may be right almost in every instance

to replace them, and to endeavour to fix them, by tying them to the contiguous firm teeth.

This being done, our next object is to retain the fractured bones in their situation till they are firmly reunited. For this purpose a variety of splints have been invented, both of pasteboard and other materials; but as a compress and bandage either of soft old linen or cotton answers the purpose with equal certainty, and as it fits with much more ease to the patient, it should always be preferred. The parts being kept firm by an assistant, a thick compress should be laid over the chin, and be made to extend from ear to ear along each jaw; and over the whole a four-headed roller should be applied in the manner I shall mention when treating of bandages. In using this bandage, it should not be made so tight as to give much uneasiness, or to endanger the circulation, at the same time that it should be applied in such a manner as

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to keep the fractured parts of the bone in close contact.

During the cure the patient should be kept perfectly quiet. He should be fed entirely on spoon-meat. He should be enjoined neither to speak or laugh, nor to use his jaws in any manner of way. To prevent the bones from being displaced, which is apt to happen from frequent inspection, the bandage should be applied with such attention, that there may be no occasion to move it often. In compound fractures of this part, there is indeed a necessity for moving the bandage daily, as the sore cannot otherwise be dressed. It should always be done, however, with the utmost attention, an assistant taking care to support the parts with his hands during the whole time.

The management of a fracture of one or both jaw-bones is exactly similar; only where both bones are broken, still more attention is required than when one only is fractured. In a fracture of one of
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he bones, the patient may be allowed to eat soft meats, and to speak with freedom, in the space of three weeks: But where both bones have suffered, this should not be permitted till five or six weeks have elapsed.

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SECTION V.

Of Fractures of the Clavicles and Ribs.

THE clavicles and ribs are more liable to fractures than any other bones. This proceeds not only from the slender structure of these bones; but from the position in which they are placed, with their flat sides exposed to every injury that may be applied to them.

A fracture of the clavicle is in general easily distinguished. On the corresponding arm being smartly moved, a grating noise is produced by the ends of the bone rubbing against each other. The ends of the fractured part readily yield to pressure; and, for the most part, the
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end of the bone connected with the humerus, is pulled to some distance from the other by the weight of the arm. The motion of the humerus is impeded, and some degree of swelling, accompanied with more or less pain, takes place over the injured part.

In almost every instance of a fractured clavicle, the end connected with the sternum is higher than the other, which has suggested an idea that has very universally prevailed in the method of cure. The height of this part of the bone is supposed to proceed from its having started or risen out of its natural situation: In the reduction, therefore, of the fracture, much pains is commonly taken to press it down, and very tight bandages are employed to prevent it from rising during the cure. It will, however, be found, that this part of the bone rises very little out of its natural situation, and that the appearance of its doing so proceeds almost entirely from the other end of the bone being dragged down by the cause I have mentioned,

tioned, namely, by the weight of the arm. At any rate, no advantage is obtained from this practice: For a force that would be necessary for pressing down the end of the bone, cannot be applied without the effect of cutting the teguments, by pressing them against that part of it that is supposed to be raised; while our purpose is fully answered by raising the arm, and supporting it at a proper height. The depressed portion of the fractured clavicle is thus raised and brought into contact with the upper part of it. In some cases, indeed, of oblique fractures, it may be impossible to bring the ends of the bone in every point exactly opposite to each other: But this may be always so far accomplished as to enable us to avoid deformity, and to render the bone sufficiently strong.

When the ends of the bone are brought into contact, our object is to retain them in this situation till they are united; and, as I have observed above, this can only
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be done by affording a proper support to the arm.

The arm is usually supported by a sling hung round the neck, adapted to the length of the arm, and every where equally applied to it. But the leather case represented in Plate XCIX. fig. 1. answers the purpose with more ease and neatness. It supports the fore-arm and elbow-joint more equally and more securely: This last I may remark is a point of no small importance; for if the elbow is allowed to drop, the humerus and scapula will both fall down, by which the ends of the fractured clavicle will again be separated.

We are commonly directed in the cure of fractures of this bone to have the shoulders drawn back and the head raised; and instruments are described for effecting these purposes. No general rule, however, of this kind can be given: For in some cases we find that the fractured parts of the bone are kept exactly together when the head is bent down upon the

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breast; while in others, it is better accomplished when the head and shoulders are raised.

In other points, fractures of the clavicle must be treated like similar injuries in other parts of the body. When severe pain takes place, bleeding with leeches becomes proper; but in general, the symptoms arising from fractures of this bone are of so little importance, that the common saturnine applications prove sufficient. When the fracture is accompanied with a wound, any splinters of bone that may be discovered must be removed, and the wound itself dressed in the usual way. It is proper, however, to remark, from the vicinity of the subclavian artery, that the removal of any portion of the clavicle may be attended with danger, and ought therefore to be managed with caution.

When the ends of the fractured part are properly supported, they will in general be firmly united in the space of a fortnight; but the corresponding arm should

should never be used with freedom till the end of the fourth or fifth week.

We discover fractures of the ribs by the seat of the pain, and by pressure with the fingers. For the most part, the attending symptoms are moderate; the pain induced by the fracture is inconsiderable, no fever occurs, and the patient soon gets well: But in some instances the pain is severe from the first; the breathing becomes difficult, attended with cough, and perhaps a spitting of blood; and the pulse is quick, full, and sometimes oppressed.

It will readily be understood, that a fractured rib cannot of itself induce any of these symptoms: But in some instances the ribs are not only fractured, but pushed inwards, by which the pleura and lungs are not only compressed but lacerated; from which we may easily perceive how pain, oppressed breathing, and fever, should be induced; and from which also we may account for the emphysematous

swellings described in Chapter XXI. Section V.

In all cases of fractured ribs, it is a safe and proper practice to discharge a quantity of blood proportioned to the strength of the patient. If any inequality is discovered, by one end of the rib having risen above the other, we ought to endeavour by moderate equal pressure to replace it; and to prevent it from rising, a broad leather belt should be applied and drawn as tight as the patient can easily bear it. When the belt is properly lined, either with quilted cotton or flannel, it fits with ease even when tolerably tight; and it ought to be continued for several weeks after the accident.

Even where the symptoms have at first been severe, they commonly subside upon the patient being freely blooded and kept quiet and on a low regimen: But where the oppressed breathing is kept up by air escaping from a puncture in the surface of the lungs, or by blood discharged

ged from a ruptured artery into the cavity of the chest, or when the pain is prevented from subsiding by the fractured rib being forced in upon the pleura; it becomes necessary to make an opening with a scalpel. Where a portion of rib is merely forced inwards, the opening should be made directly upon the injured part; and on the rib being laid bare, the depressed part of it should be raised, either with the fingers, forceps, or spatula. When the symptoms proceed from air or blood collected in the cavity of the chest, an opening should be made to discharge them, in the manner pointed out in Chapter XXI. Sect. III. and V.

Fractures of the ribs should in every instance be treated with attention; but particularly where a tendency takes place to phthisis pulmonalis, when the irritation produced by a fractured rib is very apt to do harm.

SECTION VI.

Of Fractures of the Sternum.

THE support which the sternum receives from the ribs, and the degree of elasticity of which it is possessed, render it less liable than it otherwise would be to be hurt by external violence. It must necessarily, however, be injured by great degrees of force. In some cases, it is fractured without being displaced: In others, it is not only broken, but at the same time beat in upon the pleura.

A simple fracture of the sternum is to be considered in the same light with similar injuries done to the ribs, and to be treated in the same manner. But more danger is apt to ensue from any
portion

portion of this bone being forced into the chest, from the vicinity of the large blood-vessels of the breast, while the symptoms with which it is accompanied are nearly the same; namely, pain in the injured part, cough, oppressed breathing, a quick and sometimes an oppressed pulse.

By some we are told, that the depressed portion of bone may be raised by desiring the patient to make deep inspirations; by placing a barrel or a drum under his back, and keeping him lying for some time in this posture; and by the application of adhesive plasters over the corresponding teguments; when, by elevating the soft parts, the bone beneath, it is said, may frequently be raised along with them.

It is not to be supposed, however, that much advantage is to be derived from any of these methods; on the contrary, they may more likely do harm: Nor would I have mentioned them here, had it not been with a view to caution the younger part of the profession, who, finding these

modes of practice recommended by all the older writers, might have been induced to adopt them without weighing their import. As the skin is no where very intimately connected with the bone beneath, it is not probable that any portion of depressed bone will ever be raised by the external application of adhesive plasters; while, by advising deep inspirations, or laying the patient upon his back over a convex body, we would often do harm, by forcibly pushing the lungs against the depressed portion of bone.

When it therefore happens, that the pain, cough, oppressed breathing, and other symptoms, do not yield to blood-letting and other parts of an antiphlogistic course, some other method of cure should be attempted. An incision should be made upon the injured part, of a length sufficient to admit of a free examination of the bone; when the depressed piece may be raised with a levator, if the opening will admit an instrument; or when the opening in the bone is not sufficiently

I large

large for this, a perforation may be made with the trepan, in the manner I have advised in Chapter X. in similar injuries done to the skull.

I know that many will judge this to be hazardous ; but when a patient is in danger either from a portion of depressed rib or of the sternum, and which cannot otherwise be raised, I would never hesitate in advising it. If the operation is performed with caution, the bone may be raised with safety ; and this being done, the sore must be treated in the usual way. By this being neglected, either from timidity on the part of the operator, or from any other cause, many have died of phthisis pulmonalis, who otherwise might have been saved.

SECTION VII.

*Of Fractures of the Vertebrae, Os Sacrum,
Coccyx, and Ossa Innominata.*

FRACTURES of the vertebrae may be produced by falls and blows; but we meet with them more frequently from gun-shot wounds, than from any other cause.

For the most part, they terminate fatally: For although many have survived such fractures a great length of time, yet they generally linger and die of the consequences. The spinous and oblique processes

cesses of the *vertebræ* may indeed be broken without immediate danger; but very commonly the force by which this is effected, gives such a shock to the spinal marrow, as at last terminates in the death of the patient: And a fracture that extends through the body of a vertebra, will probably, in every instance, prove fatal.

We judge of the existence of this fracture, by external examination; by the force with which it was effected; by the severity of the pain; and by the parts lying below the injured vertebra becoming paralytic when the spinal marrow has been injured.

When any of the external parts of the *vertebræ* are loose, we may in general replace them with our fingers; and, confining the patient as much as possible to one posture, we may, by means of the napkin and scapulary bandage, retain them in their situation till they unite with the rest of the bone.

Where

Where this cannot be done, a patient is in general left to his fate, as it is not supposed that we can with safety expose any of the vertebræ for the purpose of replacing such parts of them as may be deranged: But wherever the spinal marrow appears to be compressed, and where there is reason to think that the compression is produced by the depression of a portion of bone, as we know from experience that every such case will terminate fatally if the cause of compression be not removed, it would surely be better to endeavour to raise it than leave the patient to certain misery and death. By laying the injured parts freely open, we may be enabled to raise that portion of bone by which the compression is produced; while, in such circumstances, it cannot add to the hazard of the patient, even allowing the attempt to prove abortive.

In a case where symptoms of paralysis were induced by a musket-bullet lodged in the substance of one of the vertebræ,

a complete recovery was obtained by extracting the bullet. A portion of depressed bone might often be removed with equal ease and safety; and there is reason to suppose that similar effects would often result from it.

In fractures of the os sacrum, the method of treatment must be nearly similar to what I have just advised in fractures of the *vertebræ*; only, where the injury is seated near to the under part of the bone, as well as in fractures of the coccyx, when any part of it is pressed inward, we may in some cases be able to replace it, by pushing it out with the finger of one hand introduced into the anus, while we co-operate outwardly with the other.

Where any of the *ossa innominata* are broken, if the injury is deeply seated, the patient ought to be placed in that posture in which he finds himself in greatest ease, and confined as much as possible to this situation, till the bones have time to unite.

nite. Blood-letting, and an attentive regimen, suited to his strength and to the violence of the symptoms, may prevent the inflammation that usually supervenes from becoming severe.

In more external fractures of these bones, we are often enabled to replace such parts of them as have been forced out of their natural situation, and with the assistance of a proper bandage, we may also be able to retain them till a cure is completed. I have now had different instances of a considerable portion of the ileum being fractured and separated from the rest, and of a cure being accomplished, by replacing the detached parts, and retaining them with a broad roller passed several times round the pelvis and upper part of the thigh.

With respect to the application of this bandage, no particular directions can be given: It must depend entirely on the judgment of the practitioner; who will apply it in the way that
he

he thinks will make it answer the purpose of fixing the bones in the securest manner.

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SECTION VIII.

Of Fractures of the Scapula.

THE scapula, from its situation, is not so liable to be fractured as other bones; but every practitioner must have met with it. It may be fractured either in the thin plate, of which it is mostly composed; or in one or other of its processes.

As the motion of the arm depends much on a sound and entire state of the scapula, and as fractures of any part of it are difficult to cure, they very commonly

monly produce a stiff unwieldy state of the corresponding arm, that in some degree often continues during the life of the patient.

Fractures of this bone are discovered by the seat of the pain; by the violence of the injury; by manual examination; and by stiffness and immobility in the corresponding arm. We are told, that fractures of the scapula are apt to be accompanied with emphysematous swellings; but they can only appear when a splinter of the bone is forced into the lungs: When this takes place, air will no doubt escape; and if it passes into the cellular substance, emphysematous swellings will necessarily occur.

In fractures of the scapula, our first object is to replace the bones with as much exactness as possible: In doing so, we are much assisted by relaxing all the muscles of the injured part. By raising the head and shoulders we relax the muscles of the back; and if, at the same time, the

humerus is supported, the deltoid muscle will be so much relaxed, that any fractured portion of the scapula will be more easily replaced. It is always however more difficult to retain the bones during the cure, than to replace them: For the detached portion being in general small, we can seldom retain it with a bandage. A proper application of a long roller is perhaps the best method of doing it; and in using this bandage, we should still take care to have the head and shoulders supported, and the arm suspended, so as to keep all the muscles of the injured part as much as possible relaxed.

As all fractures are apt to excite inflammation, I have elsewhere observed, that this symptom should at all times be guarded against. No where is it more necessary to attend to this than in fractures of the scapula, where inflammation is particularly apt to proceed to an alarming height. Blood-letting should therefore be freely practised; particularly local

cal blood-letting with leeches, or cupping and scarifying ; a remedy that I consider as more effectual than any other for the removal of inflammation wherever it is seated.

SECTION IX.

Of Fractures of the Humerus.

FRACTURES of this bone are easily discovered, as no part of it is thickly covered with soft parts: Oblique fractures become evident to the sight, but even those that are perfectly transverse become immediately obvious on the slightest manual examination.

In the reduction of fractures of this bone, we do not find that much extension is required; but that it may be done with ease, the muscles of the arm should be put as much as possible into a state of relaxation; this we do by moderately bending the elbow, at the same time that
the

the limb is raised nearly to a horizontal direction, and not carried so much forward as to put the latissimus dorsi, inserted into the back part of it, on the stretch, or too far back to stretch the pectoral muscle.

The patient being properly placed, and the arm put in this situation, the surgeon will in general be able to replace the bones without any assistance: But when extension is necessary, it may be applied by one assistant grasping the arm between the fracture and joint of the shoulder, and another above the joint of the elbow.

In this manner the fractured bone is to be exactly replaced; and with a view to secure the fractured parts in their situation, a firm splint, such as is represented in Plate LXXXI. fig. 5. and 6. should be laid along the whole outside of the arm, and another along the inside of it, each of them covered with soft flannel, to prevent them from galling the skin; and while these are secured by one assistant, and the fore-arm supported by an-

other, a flannel roller should be applied over the whole, of such tightness as to support the ends of the fractured bone without interrupting the circulation of the limb.

The fore-arm should be supported in a sling, such as is represented in Plate XCIX. fig. 1. and the patient may be either put to bed or allowed to sit, as is most agreeable to himself. It may not, however, be improper to remark, that it answers better to have the arm in a hanging position than laid horizontally on a pillow; particularly in oblique fractures of this bone, in which the weight of the limb has a considerable effect in preventing the ends of the bone from overlapping or passing each other. Even in bed, therefore, where there is any danger of this, the patient should be placed in such a manner that his arm may hang instead of being laid in the usual way upon a pillow. In transverse fractures this precaution is not so necessary, as the ends of the bone, if once replaced, serve in some

measure to support each other. But even in these, it is the best practice to support the fore-arm in such a manner that it may have some effect in pulling the under part of the humerus gently downwards.

When no urgent symptom takes place, such as much pain and swelling of the arm, the bandage should not be moved for several days: But about the seventh or eighth day, it is proper in every fracture to remove all the coverings, in order to see whether the bone is perfectly in its place or not; for at this period any accidental displacement may be easily put right, and a cautious inspection may be made with safety.

I have advised a roller to be employed for fractures of this bone; and perhaps it is the only instance in fractures of the large bones of the extremities in which it should be preferred to the twelve-tailed bandage. But whoever has used them both will find, that in simple fractures of the humerus, the roller is not only more easi-

ly applied than the other, but that it answers the purpose better.

Fractures of the humerus commonly heal more kindly than similar injuries of any other bone; and when properly managed, they seldom leave either lameness or distortion of the arm. When no interruption occurs to the cure, either from severe pain, swelling, or inflammation, or from accident or mismanagement, the bone will in general be firmly united in less than a month; but the limb should not be used with much freedom till six or seven weeks have elapsed.

SECTION X.

Of Fractures of the Bones of the Fore-Arm.

THE bones composing the fore-arm are two in number, the radius and ulna. Being much exposed to injuries, they are very liable to fractures. When both bones are broken, the nature and seat of the injury at once becomes obvious; but when one bone only is fractured, especially the radius, as the firmness of the ulna keeps it on the stretch, and prevents it from being displaced, we do not so easily perceive the injury: The seat of the pain points out the injured part; and when either of the bones is fractured, a grating noise will be heard
if

if the surgeon grasps the limb firmly above and below this part, and endeavours to move it in different directions.

In this examination, it is of much importance to distinguish the direction of the fracture with as much exactness as possible, particularly if near to the wrist; for upon this the chance of our making a proper cure in a great measure depends; and in this situation, whether both bones or only one of them is broken, much attention is required to prevent the stiff uneasy state of the arm from continuing long after the bones are united: Patients indeed often complain of this, in some cases during life; and I think it more frequently happens when the radius is broken by itself than when the ulna only is fractured, owing, I suppose, to the radius having a rotatory motion independent of the other, by which it is not so easily kept in its situation. And as there is nothing for which practitioners are more apt to be blamed than for those inconveniencies that succeed to fractures, we ought, in eve-

ry instance to be as much as possible on our guard against them.

On the seat of the injury being discovered, if any part of either of the bones is displaced, we ought, as soon as it can be done, to put it right. The patient being properly seated, and the muscles of the arm relaxed by gently bending the joints of the wrist and elbow, the forearm should be extended to such a degree, by one assistant grasping it above the fracture, and another below, as is just sufficient to allow the surgeon to replace the bones. This being done, one of the splints represented in Plate LXXXI. fig. 3. 4. or 5. covered with soft flannel, and of a length to reach from the elbow to the tops of the fingers, and of such a breadth as to incase rather more than one half of the arm and hand, should be placed along the ulna. Another splint not quite so broad must be placed along the course of the radius; when both must be secured either with a flannel roller or a twelve-tailed bandage, with such tightness as
may

may prevent the bones from slipping out of their place, but without impeding the circulation, or exciting any degree of pain. In all simple fractures of these bones, the twelve-tailed bandage, and simple roller, may be used with perhaps equal propriety.

In applying the splints, the palm of the hand should be turned towards the breast, this being not only the most convenient posture in which the arm can hang while in a sling, but the best in which it can at all times be placed, even when the patient is in bed: For the palm of the hand can neither be turned up nor down; that is, it can neither be put into a prone nor a supine posture, without giving that rotatory motion to the radius that I have mentioned, and which tends more than any other to displace any part of this bone that may be fractured. It should therefore be avoided; and I know of no way in which it can with such certainty be done, as securing the arm with splints in the manner I have mentioned:

It

It should now be hung in the sling represented in Plate XCIX. fig. 1. and allowed to remain in the leather case during the night, or in any small box of a similar construction, and of a size just sufficient to receive the arm when placed upon its side, but without permitting it to turn either one way or another.

In speaking of the splints, I have advised them to be of a sufficient length for stretching along the whole course of the arm from the elbow to the top of the fingers. The under splint ought more especially be of this length: For the arm not only rests with more ease and equality upon a long splint, but it serves to cover the fingers, by which they are prevented more effectually than in any other manner from moving; a circumstance of much importance in every fracture of the fore-arm: For when a free motion of the fingers is permitted, it not only tends to keep up inflammation and pain, but is often the cause of the bones being again

again displaced, when otherwise they might have been kept in contact.

A partial dislocation of the bones forming the joint of the wrist, is not an unfrequent concomitant of fractures of the radius; from a combination of which, there is always much risk of a stiffness being left in the joint, and of a painful permanent swelling over the under part of the arm: With this the patient should always be made acquainted; for even under the best management, a dislocation of the wrist, accompanied with a fracture of the contiguous bones, commonly ends in this manner: For the method of reducing the dislocation, I must refer to the ensuing chapter; and I have already pointed out, in the first Section of this Chapter, what I conceive to be the best method of preventing and removing inflammation; which I have there shewn to be the most frequent cause of that stiff immoveable state in which fractured limbs are often left.

The olecranon, or upper end of the ulna, is sometimes fractured without any injury being done to the rest of the bone; this part of the bone being particularly apt to suffer from falls and bruises upon the elbow.

In this case, in order to keep the fractured parts in contact, the fore-arm must be extended: And with a view to preserve the arm in this situation, a long splint should be laid along the fore-part of it, from the upper part of the humerus to the tops of the fingers; and this being secured with a roller, the arm should be allowed to hang by the side, to which it should be fixed with one or two straps.

It is proper, however, to remark, that it should not be long kept in this situation, otherwise a stiffness of the elbow-joint would ensue: With a view to the prevention of this, the bandage and splint should be removed about the eighth or
tenth

tenth day; when the fore-arm being for some time moved slowly backward and forward, and the joint rubbed with an emollient oil, the arm should be again secured as before. A cautious and daily repetition of this, while it prevents a stiff joint, does not retard the cure.

S E C-

SECTION XI.

*Of Fractures of the Bones of the Wrist, Hands,
and Fingers.*

THE bones of the wrist being small, round, and somewhat moveable, readily yield to any ordinary force that may be applied to them. On this account, they are seldom fractured, except by shot from fire-arms, or a heavy weight passing over them.

These bones are so small that when fractured they do not readily reunite. For this reason, as well as from the contiguity of tendons and ligaments, which gives rise to high degrees of inflammation, a complete ankylosis, or great stiffness of the joint, often succeed. After replacing the bones, these consequences are with

most certainty guarded against, by a copious discharge of blood from the injured parts by means of leeches: And this being done, the arm and hand should be well supported by a splint beneath, and another above, in the manner advised in the last section.

In fractures of the metacarpal bones, after being replaced with accuracy, a firm splint, either of timber or strong pasteboard, should be applied over the whole palm of the hand and inside of the arm, from the ends of the fingers to the joint of the elbow, in order to keep the hand in a state of extension, as the flexor muscles of the fingers cannot be bent without altering the position of these bones: And that this may with certainty be done, the long splints mentioned above, secured with a similar bandage, should be applied over the whole.

Fractures of the bones of the fingers are frequent; but when properly treated, they readily unite, and the fingers become equally useful as before.

The

The best splint for a fractured finger is a piece of firm pasteboard fitted to it with accuracy, and softened in water till it is easily moulded to the form of the part. The finger being stretched out and the bone replaced, this splint should be applied along the whole length of it, and secured with a narrow roller. In order to prevent the injured parts from being disturbed, a large splint, either of the same kind of pasteboard, or of a thin piece of wood glued upon leather, as is represented in Plate LXXXI. fig. 3, 4, 5, or 6, should be applied over the inside of the hand; and the fingers being stretched upon it, another roller should be put over the whole, to secure the fingers and hand, so as to prevent all kind of motion.

With a view to preserve the motion of the finger-joints, the bandage and splints should be removed about the tenth or twelfth day; when all the joints being frequently bent and extended, the whole should be tied up as before: And this being

ing repeated daily, the splints may with safety be removed at the end of the third week; when, by this piece of attention, the motion of the finger will be found complete, unless more than one bone has been broken, and at the same time severely splintered.

END OF VOLUME SIXTH.



PLATE LXX.

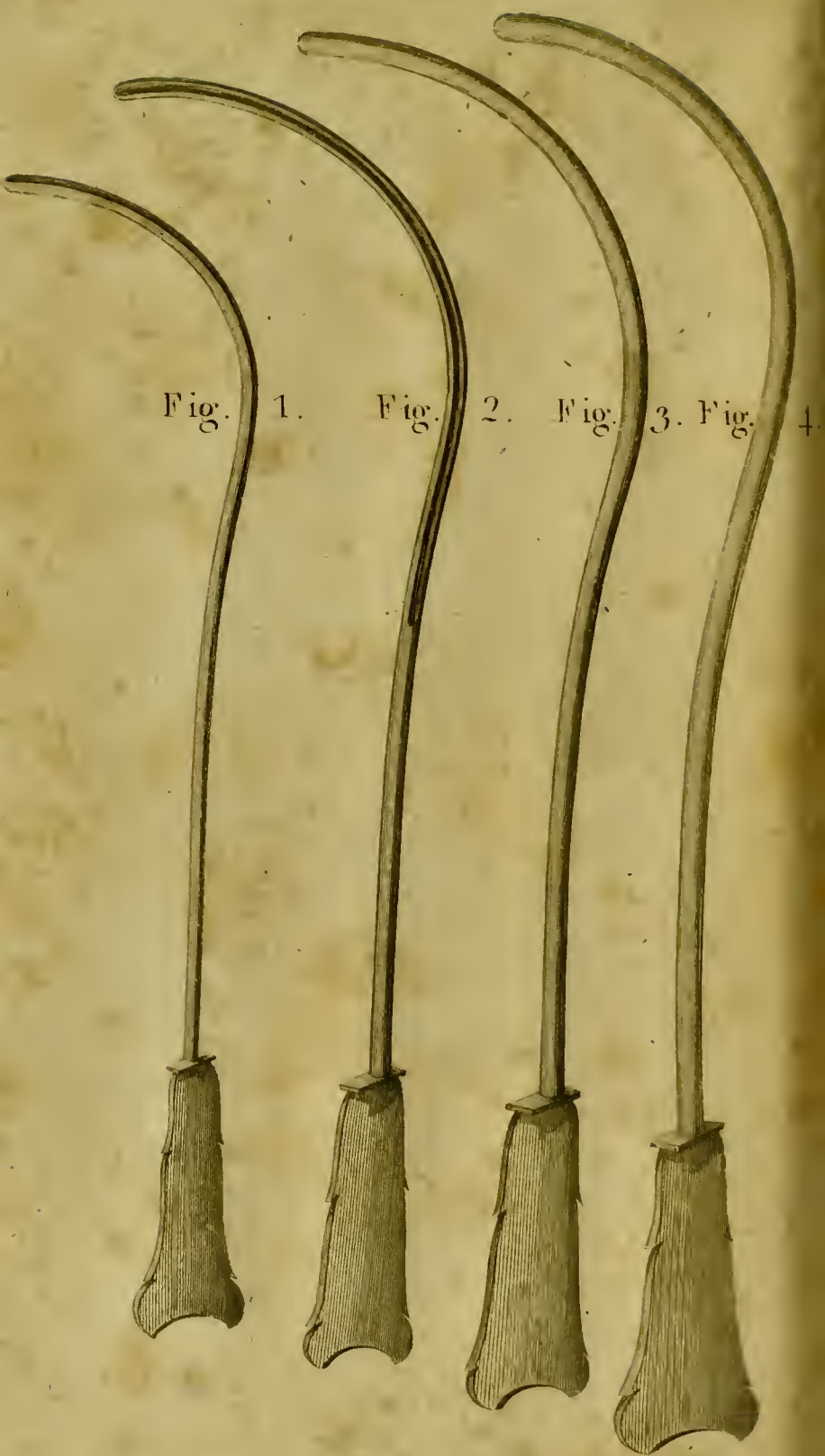




Fig. 1.

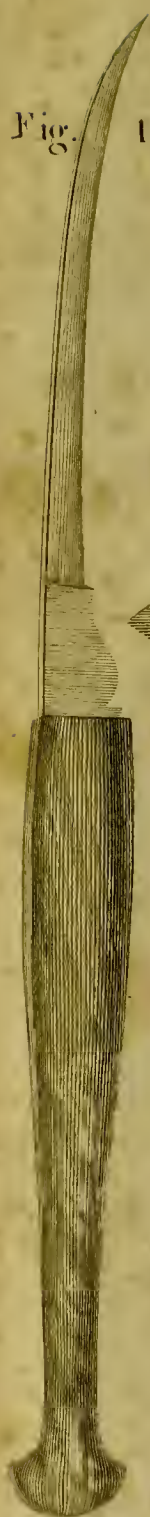


Fig. 2.

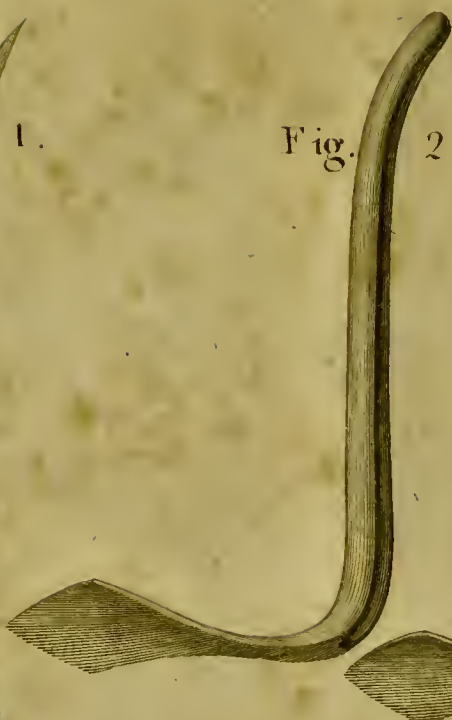
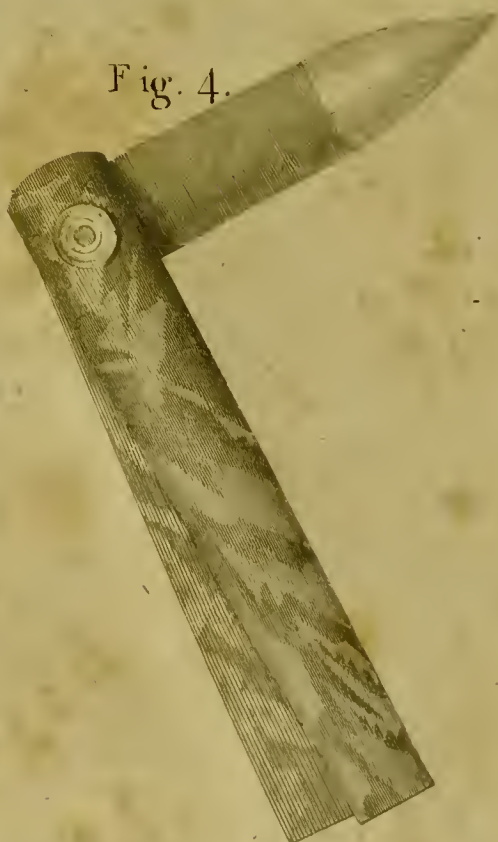


Fig. 3.



Fig. 4.



EXPLANATION
OF THE
P L A T E S.

PLATE LXVIII.

Fig. 1, 2. and 3. **R**EPRESENT a set of instruments for the operation of the phymosis, described in Chap. XXVIII. Volume VI. page 60.

PLATE LXIX.

Fig. 1. and 2. Staffs for the purpose of sounding.

Fig. 3. A grooved staff for the operation of lithotomy, with the groove on one side. This improvement was suggested
VOL. VI. K k for

for the purpose of passing the gorget more easily into the bladder than when the groove is on the convex part of the instrument: But the usual form of the staff is found to conduct the gorget with much ease; so that this alteration has not been generally adopted.

Fig. 3. A common staff of the usual form, with the groove on the convex part of it.

The curvature here given to these instruments has by experience been found to answer better than any other: There is no necessity for that degree of convexity generally given to staffs: The form here represented is introduced with more ease; and does not injure the urethra, which those with a greater curvature are very apt to do. A sound entirely straight indeed may be easily passed into the bladder, merely by stretching the penis in such a manner, that the urethra may be kept in a direct line with the arch formed by the junction of the ossa pubis: But a staff entirely straight is ill fitted



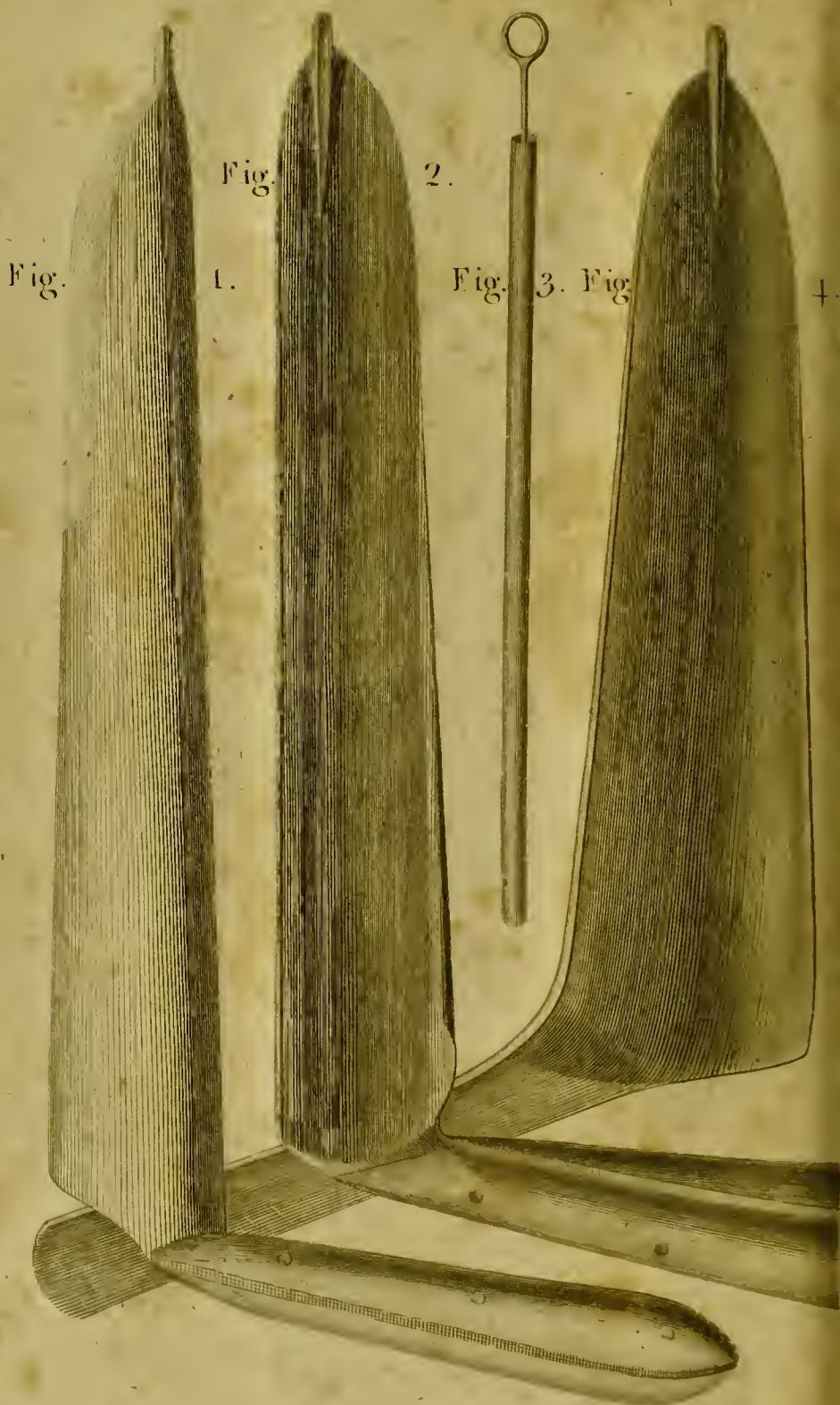


fitted for exploring the different parts of the bladder ; so that more or less curvature according to the opinion of the operator, is always given to it.

A staff for a full-grown male subject should be twelve inches long, besides the handle ; and for children of seven years and under, they should be from seven to nine inches long.

PLATE LXX.

This instrument should for adults be five inches and a half in length besides the handle ; an inch and quarter broad at its widest part, and made to contract in a gradual manner to the point : The beak should be exactly adapted to the grooves of the staffs with which it is used ; and should be turned a little forward, instead of being perfectly straight or turned back as is sometimes done : By this means it is carried with more steadiness along the groove of the staff than can otherwise be done. In Volume VI. Chap.



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PLATE LXX.

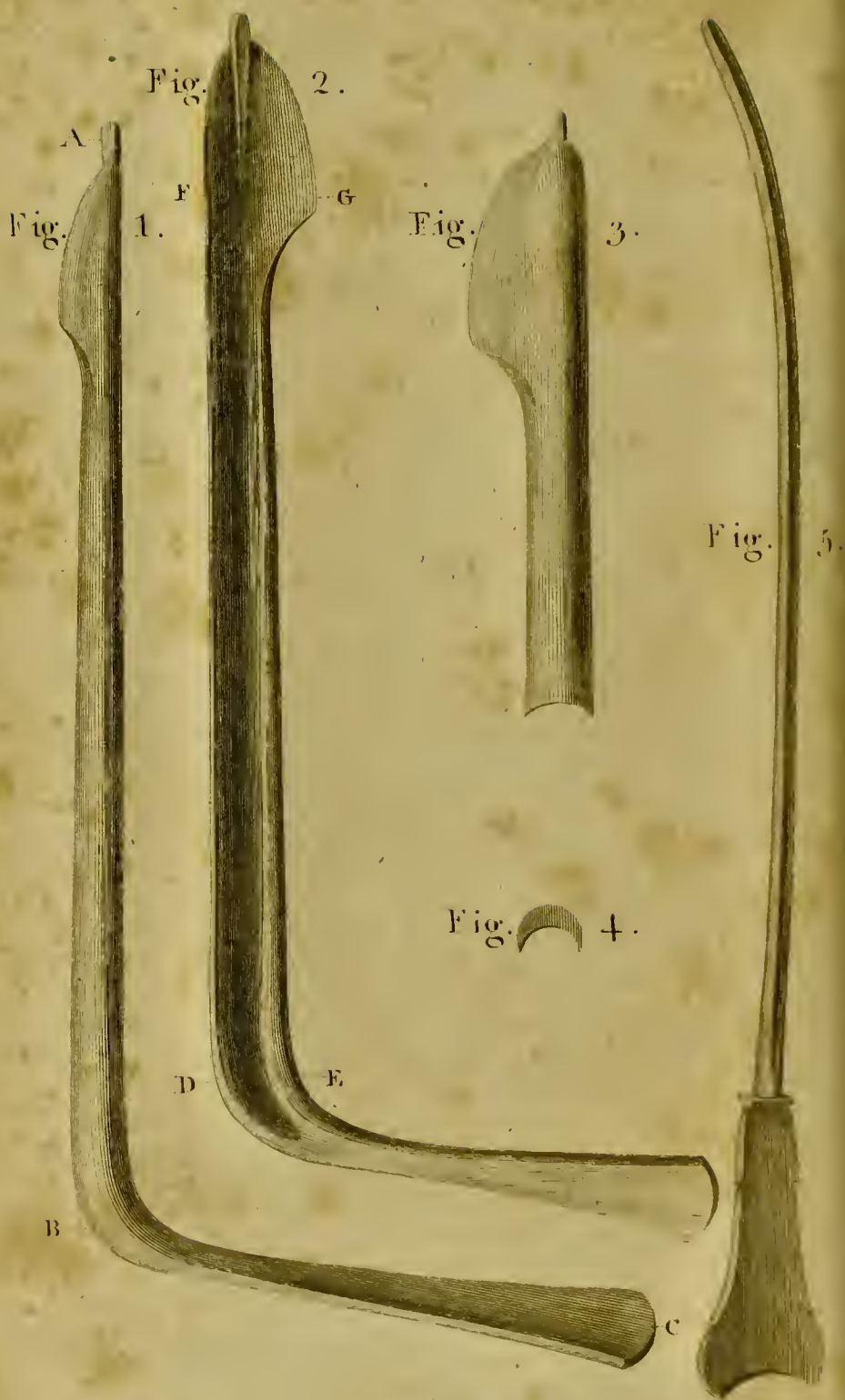
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XXIX. Sect. VII. I have mentioned some objections to this gorget, and the reasons that induce me to consider the alterations made upon it in fig. 1. and 2. of the same plate, as well as the cutting director Plate LXXI. as preferable instruments, In fig. 1. and 2. the left or blunt side of the gorget is not near so broad as in the gorget of Mr Hawkins, by which it enters with more ease, and does not tear the parts so much. The handle goes off nearly at a right angle from the body of the instrument, instead of having an oblique direction as in fig. 4.; and being made of timber instead of steel, the surgeon holds it with more ease and firmness.

Fig. 3. A female catheter. This instrument is represented straight, as being more easily introduced than when much crooked: A sound for females, however, should have a small curvature, as being better adapted for discovering a stone in the bladder than a straight staff.



PLATE LXI.



A grooved staff of this form is represented in fig. 5. Plate LXXI.

Fig. 4. The cutting gorget of Mr Hawkins, with the edge made to expand more than the usual form of this instrument, by which it divides the prostate gland more freely.

PLATE LXXI.

Fig. 1. A side-view of the cutting director described in Volume VI. Chap. XXIX. Sect. VII. This instrument for adults should be five inches and a half from *A* to *B*, and three inches from *B* to *C*.

Fig. 2. Represents a front-view of the same instrument.

Fig. 3. Affords a back-view of it; and fig. 4. a transverse section.

This director, in the grooved part, it should be three-eighths of an inch broad, namely from *D* to *E*; and the cutting part of it, from *F* to *G*, should measure nearly an inch. The beak should be exactly fitted to the groove of the staff with which it is to be used.

In order to obtain a free passage for the stone, it has been proposed to increase the breadth of the cutting part of Mr Hawkins's gorget to a great extent : By some, it has even been said that it may be two inches broad. This, however, proceeds from inattention to the anatomy of the parts concerned in the operation; for that part of the urethra through which the gorget must pass to the bladder, is so much confined by the contiguous bones, that it is absolutely impossible to pass a gorget of this size into it in a proper direction. The prostate gland should be divided laterally in a horizontal direction. Now, this cannot be done with an instrument of this breadth. But, even although it were easily practicable, there is no necessity for such an extensive wound as this instrument would make. I have elsewhere said, that nothing should be left for the director or gorget to divide but the prostate gland, together with a very small portion of the neck of the bladder; and as this is done in the most complete manner,

both

both by the cutting director of this plate, and the improved gorget of Mr Hawkins in figures 1. and 2. Plate LXX. an instrument of a greater breadth is not necessary.

The back part of the cutting director being considerably narrower than the common gorget, it ought to be of sufficient thickness, in order to overcome any resistance with which it may meet in passing into the bladder. The transverse section, fig. 4. shows the strength of it.

For children from three to seven years of age, this instrument should not exceed three inches in length; and one of four inches will answer for every age above this to the twentieth year.

The cutting edge of this director, as well as the cutting part of the gorget in Plate LXX. is represented upon the right side of the instrument, by which the wound in the operation of lithotomy is made in the left side of the patient: But for a surgeon who operates with his left-hand this must be reversed, so that the cut may

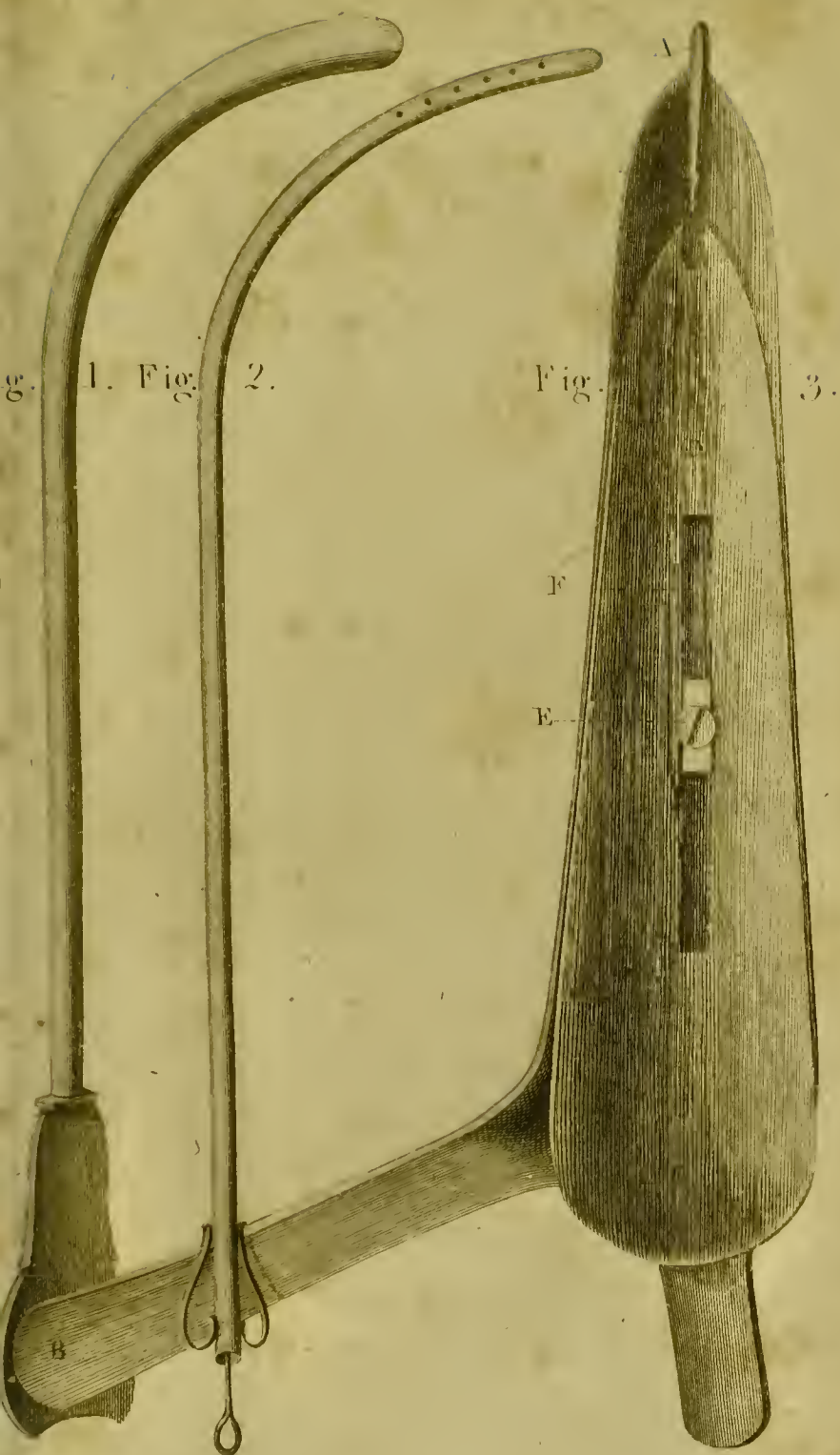
be made in the right side of the perinæum.

Fig. 5. A grooved staff for the operation of lithotomy in females.

PLATE LXXII.

Fig. 1. An instrument I have named a Searcher.

In the operation of lithotomy, it frequently happens, that the stone is not readily felt with the forceps. When not discovered by the other means I have advised, it may frequently be found by introducing this instrument at the wound; being of considerable thickness, it answers better for this purpose than a common sound; and when once the stone is discovered, the searcher should be kept in close contact with it with one hand, while the forceps are conducted to the stone by means of it with the other. In this manner, stones are sometimes discovered, which could not otherwise be met with.





with. This instrument should be made of steel, and should be nine or ten inches in length.

Fig. 2. A male catheter of silver. The small holes near the extremity of this instrument answer better than a slit on each side, as with these it does not so readily catch the membrane of the urethra. Catheters have likewise been made of other materials, namely, of leather, and of flexible silver-wire rolled into the form of a tube, and covered with bougie plaster; and a few years ago a very neat invention appeared, prepared of *resina elastica*. These last prove particularly useful in cases that require catheters to remain in the bladder for some days together; and of late I have found, that when properly prepared, they retain their firmness for a considerable time. I have kept a catheter of this resin in the bladder for three weeks together, without being hurt by the urine.

Fig. 3. Is an improvement of the gor-
2 get

get by Dr Monro. It consists of a common gorget *AB*, with a blunt gorget *CD* fitted to it: The nail *E* fixed in the cutting gorget passing through the slit in the blunt gorget *F*, the latter is thus made to run easily upon it. In using this instrument, the blunt gorget must be pulled back, so as to admit of all the cutting part of the other to project before it: And as soon as it has reached the bladder, the blunt gorget should be pushed forward; by which means the contiguous parts are effectually protected from farther injury, as the side of the blunt gorget should be made considerably deeper, so as to project over the cutting edges of the other.

This is an ingenious contrivance; and it answers the purpose completely, of protecting the surrounding parts while the instrument is withdrawing; a point of much importance, and not always duly attended to.



Fig. 1.

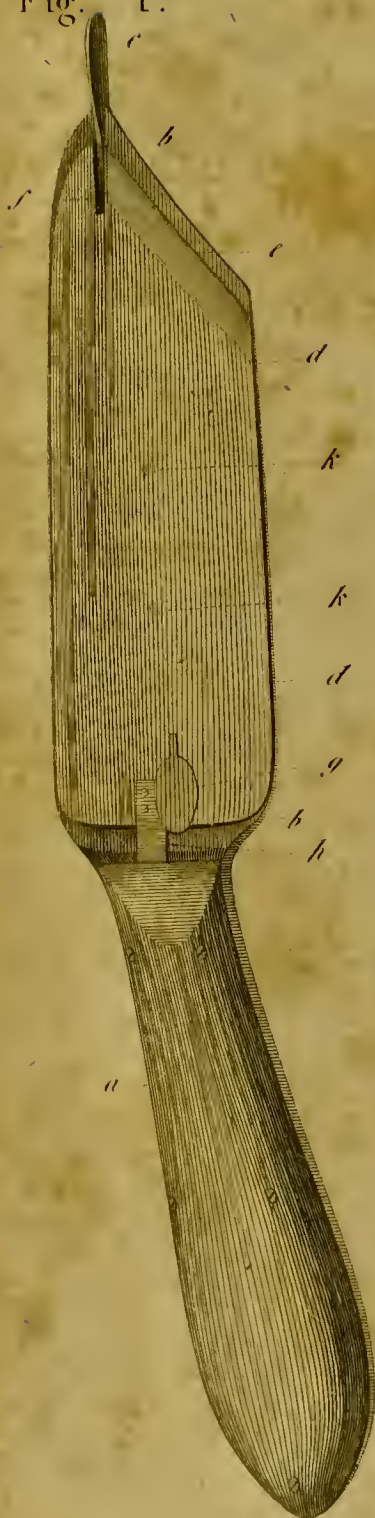


Fig. 2.





Fig. 4.



Fig. 3.



Fig.

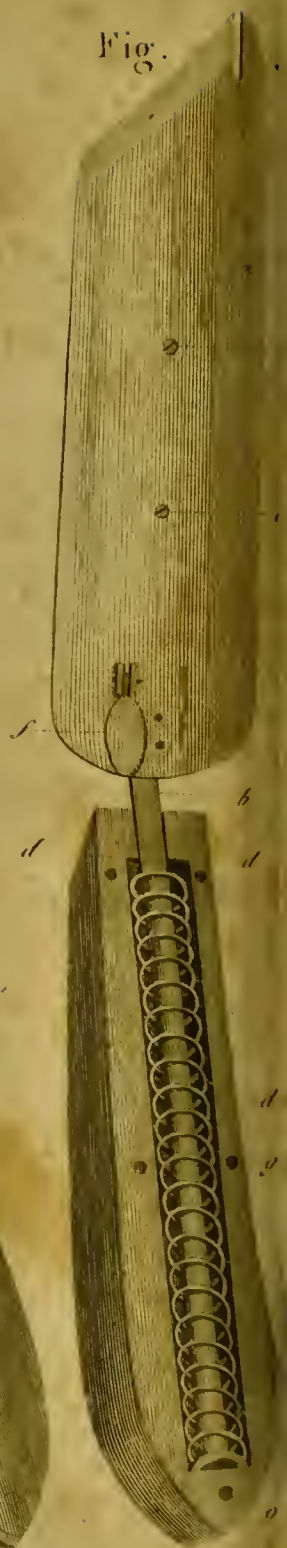


PLATE LXXIII. Parts I. and II.

The instruments of both parts of this plate represent a very ingenious improvement of the gorget by Dr Jeffray of Glasgów ; in which, besides an alteration in the form of the gorget, a blunt and cutting gorget are very neatly connected together, as may be seen by the following explanation.

Fig. 1. Represents a spring double gorget, having the cutting gorget drawn back.

a, a, The handle. *b, b*, The blunt gorget, with *c*, its knob, whose spine runs, for some way, down on the blade. *d, d*, The cutting gorget. *f*, A slit, in the anterior end of the cutting gorget ; on the right of this slit, the edge is sharp ; on the left, it is blunt. *g*, A thumb-piece. *h*, A flat spring passing down from the base of the cutting gorget into the hollow handle

handle *a, a.* *k, k,* Two nails connecting the two gorgets together in a way afterwards described.

Fig. 2. Represents the same gorget, having the cutting gorget pushed forward and prepared for the operation.

a, a, The handle. *b,* The blunt gorget with *c* its knob. *d,* The cutting gorget, with its sharp edge projecting, and its slit receiving and kept from moving to either side by the spine of *c.* *e,* The thumb-piece raised.

Fig. 3. Part II. A back view of the gorget. *a,* The back plate, thin, and slightly convex, covering parts represented in the following figures.

Fig. 4. A front view of the blunt gorget. *a, a,* The metallic part of the handle, with holes in it for the screw-nails that fix on it the hollow wooden part of the handle represented in fig. 5. *b,* The blade of the blunt gorget. *c,* A long slit in *b,* in which are two nails. *d, f, e,* The flat thin head, the screwed point, and the roller of these nails. *g, g,* Their

Their heads, and resting lightly on the blunt gorget. *b, b*, Their rollers, in the slit, on a level with the anterior surface of the blunt gorget, their diameter being somewhat less than the breadth of the slit, that they may turn, in the slit, easily on their nails. *i, i*, Their points. When the two gorgets are to be put together as in fig. 1. and 2. Part I. the back of the cutting gorget is applied to the face of the blunt one. The two rollers are laid in the slit of the blunt gorget over the two holes of the cutting gorget seen at *k, k*, fig. 1. the nails are passed through the rollers and screwed into the holes *k, k*, till their flat heads touch the back of the blunt gorget. The back plate is then screwed on, covering the heads of the nails and the slit, making the back of the instrument smooth. These nails therefore not only hold the two gorgets together, but with the spine on the knob of the blunt gorget permit the cutting gorget to move backwards and forwards only, while the rollers make that motion
sweet

sweet and easy. *k*, Another slit in the blunt gorget, in which the heel of the thumb-piece moves. It likewise is covered by the back plate.

Fig. 5. A back view of the cutting gorget. *a*, The wood in part of the handle hollowed out to receive *b*, the flat spring that is connected (fig. 1. and 2.) to the base of the cutting gorget, and terminates in a flat buttonlike head *c*. *d*, The spiral spring, that surrounds the flat spring. One end of this spiral spring rests against or may be fixed into the flat head of *b*; the other rests against or may be fixed into *d*, *d*, the checks or anterior end of the groove in the wooden handle. *e*, *e*, The holes for the connecting and directing nails. *f*, The back of the thumb-piece connected by a transverse screw-nail to two projections from the back of the cutting gorget. *g*, *g*, Holes for the nails that connect the wooden and metallic parts of the handle together. *N. B.* Both the cutting and blunt gorgets diminish a little in breadth from

from heel to point, by which the cutting gorget when pushed forward is broader than that part of the blunt gorget immediately behind it. When however the cutting gorget is drawn back, it is narrower, and is defended by that part of the blunt gorget before which it lies.

From the figures and the description of this instrument, the manner of using it will be understood. The surgeon holding it in his right hand as he does the common gorget, raises the thumb-piece, and applying his right thumb to it, pushes forward the cutting gorget till the anterior connecting nail reaches the end of the slit, the buttonlike head of the flat spring, following the cutting gorget, compresses the spiral spring. The cutting edge now projecting, and the instrument being in every essential point like the common cutting gorget, it is introduced into the bladder in the usual way; but as soon as this is done, the surgeon, without taking his left hand from the staff, or deranging his right hand, raises his

his right thumb; the cutting gorget is instantly drawn back, the thumb-piece falls down; and the gorget, now in every material article a blunt gorget, remains in the wound, presenting a smooth surface, for conducting the finger or forceps, into the bladder, in quest of the stone.

PLATE LXXIV.

Fig. 1. An instrument invented by Dr Butter for injecting liquids into the bladder: *A A*, the handles of two thin plates of timber, which serve to compress a bladder placed between them, in which the liquor to be injected is contained. *B*, the stop cock of a pipe with which the bladder must be connected: And to the extremity of this short pipe a longer tube *C* is adapted, to be inserted into the urethra when the liquid is to be injected. Fig. 5. is a funnel for conveying the liquid into the bladder, by inserting the small end of it into the short pipe near to *B*, on the tube *C* being removed.

Fig.

Fig. 1.

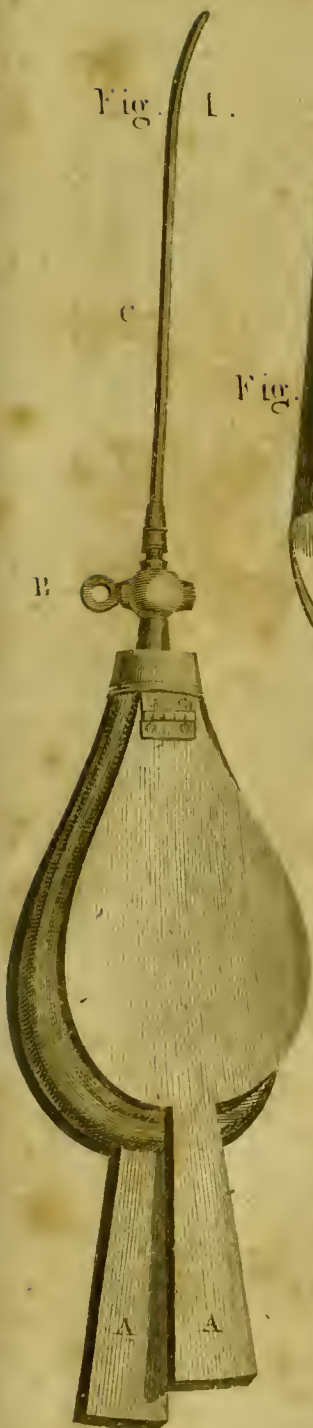


Fig. 2.

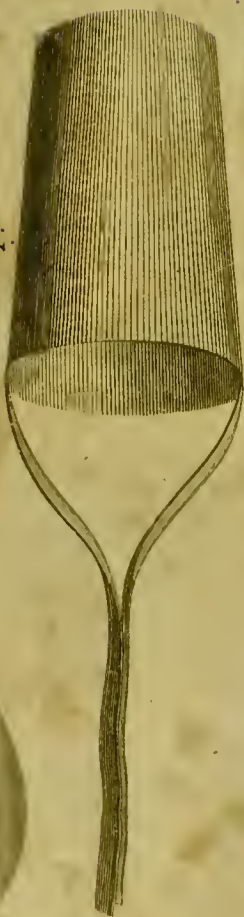


Fig. 3.



Fig. 4.



Fig. 5.

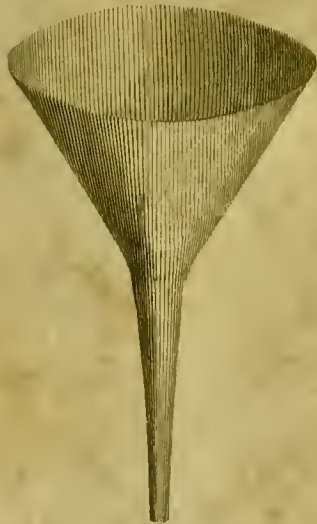




Fig. 2. A pessary for herniæ falling into the vagina : It may be made either of *resina elastica*, ivory, or *lignum vitæ*.

Fig. 3. and 4. Two pessaries for supporting the prolapsed parts in cases of *prolapsus uteri*, and for compressing the urethra in cases of incontinence of urine. Before being introduced, they should be well covered with oil ; and they should be made to lie directly across the vagina, so as to support the prolapsed parts as much as possible. These instruments may be made of any timber capable of receiving a fine polish : But much attention, I may remark, is necessary to this circumstance ; for unless they are perfectly smooth, they cannot be continued. Pessaries tend to support the relaxed parts better than any other remedy ; but even polished in the best manner, they are apt to excite so much irritation as to become altogether inadmissible.

PLATE LXXV.

Fig. 1. and 2. Forceps of different sizes for extracting stones from the bladder.— For a full grown adult they should be ten inches long and proportionally strong. Every operator ought to be furnished with three or four sizes from those of ten inches to such as do not exceed seven. I have already desired, that the blades of the forceps may not meet when shut; otherwise they are apt to lay hold of the bladder; and for the same reason, their teeth ought not to be long. The hollow part of the blades should be rough, by which they fix the stone with sufficient firmness; but even this roughness should be confined to within an inch of the point; for when it extends to the joint, small stones are apt to fix in this part, and to dilate the blades of the instrument much more than they otherwise would do.

Fig. 3. Forceps with a small curvature. When the forceps of the usual form do not easily lay hold of a stone, such as are somewhat

Fig.

L.

Fig.

2.

Fig.

3.

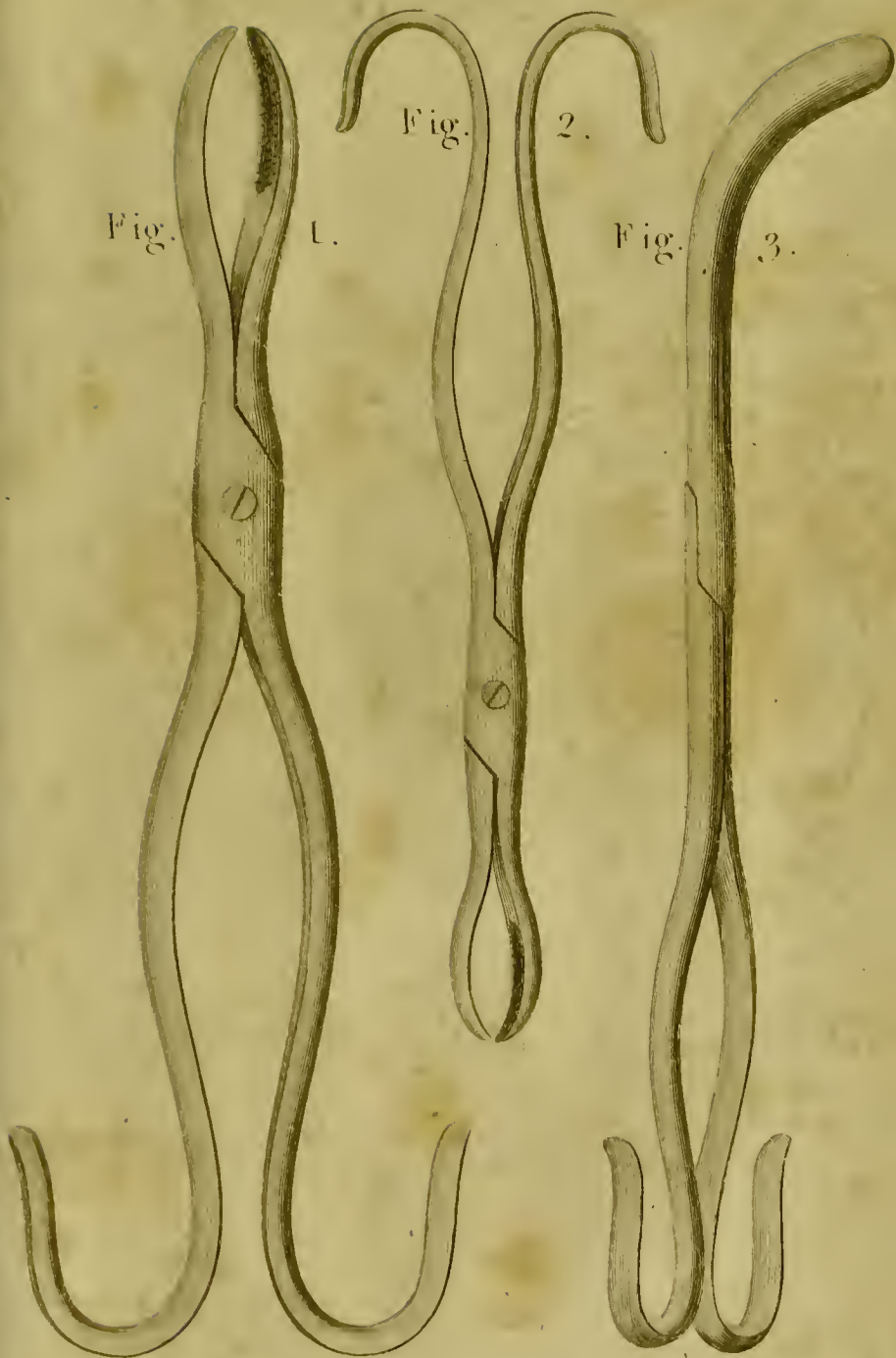




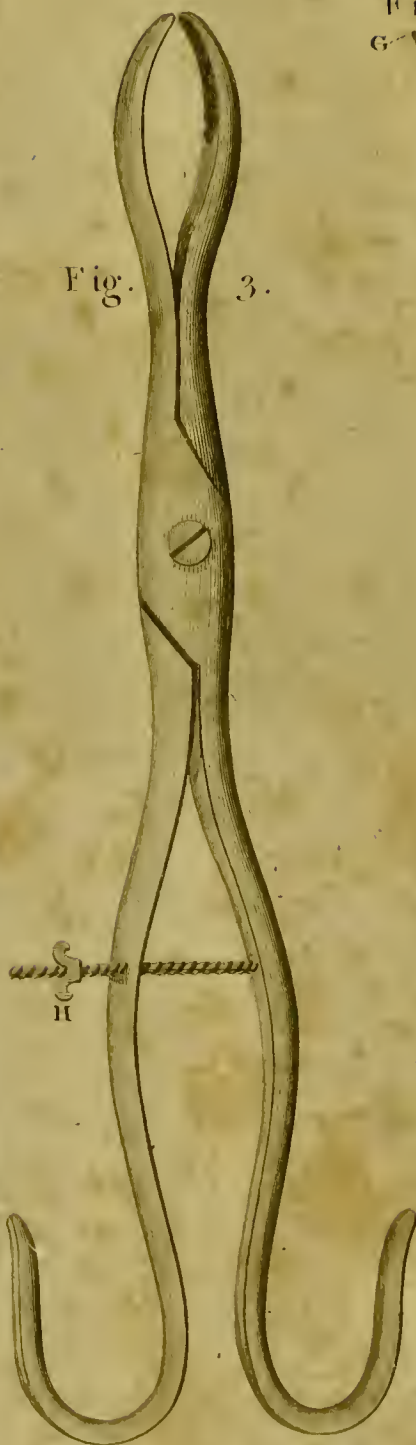
Fig. 1.



Fig. 2.



Fig. 3.



somewhat crooked will sometimes meet with it: In general, however, straight forceps answer all the purposes of the others; and as stones, when laid hold of, are always more easily taken out with straight forceps, they should commonly be preferred.

PLATE LXXVI.

Fig. 1. and 2. Different views of Frere Cosme's instrument for the operation of lithotomy. Fig. 1. Represents the instrument shut; and fig. 2. gives a view of it open.—The handle *A* with which the nitches *B* are connected, being kept in the situation represented in fig. 1. by the spring *C* being fixed in one of the nitches, the knife is thus kept shut. But when the spring *C* is pressed upon, so as to raise it out of the nitch, as the handle *A* is made to move upon a pivot, it may now be turned; and the projecting part of it *D* being turned fully round, if pressure is now applied to *E*, it will raise the knife

L 1 2

E,

F, fig. 2. with which it is connected, to the elevation here represented.—The point *G* should be made blunt and round, so as to run with ease and freedom in the groove of a staff. The length of this instrument, including the handle, should be ten inches.

The method of using it is as follows : All the previous steps of the operation being finished, and the urethra being cut in the manner I have directed in the lateral operation, the beak of the instrument *G* is to be conveyed into the groove of the staff, and while shut pushed into the bladder. The staff is now to be withdrawn ; and pressure being applied to *E*, so as to elevate the knife *F*, it is now to be drawn out in such a direction as to divide the prostate gland laterally, when the forceps may be either introduced by running them in upon the fore-finger of the left hand, or upon a blunt gorget employed for the purpose.

Various instruments of this kind have been invented ; but this is the most simple, and in every respect, indeed, the best of any I have met with. As the operation

is

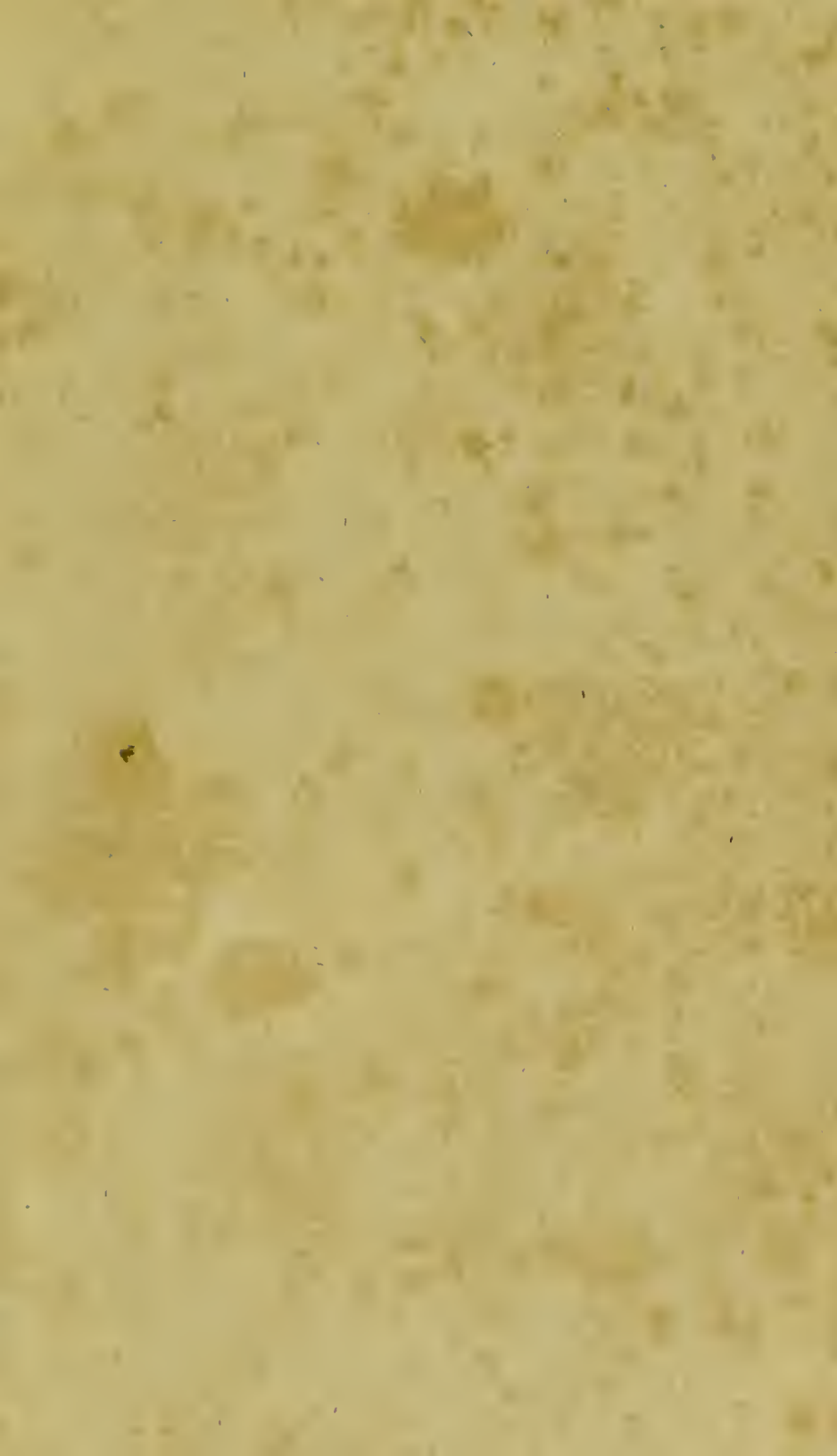
is still performed with it in different parts of Europe, particularly in France, I think it right to represent it, but not with a view to recommend it.—The objections which occur to it are these: Although by the form of the handle the blade or cutting part of the instrument may be elevated to any necessary degree, yet this does not ensure the formation of a wound of a fixed and determined size. It has indeed been asserted by those who think favourably of this instrument, that a wound of any determined size may be made with it; but this is by no means the case; and whoever will give it a trial will find, that the wound which it makes varies in size in every two that are cut with it; and this, even with the blade at the same degree of elevation; for the cutting part of it is at such a distance from the handle, that it is impossible for a surgeon always to withdraw it so steadily, as to cut uniformly in the same direction; and if in one case it is made to press more to one side than in another, the wound that

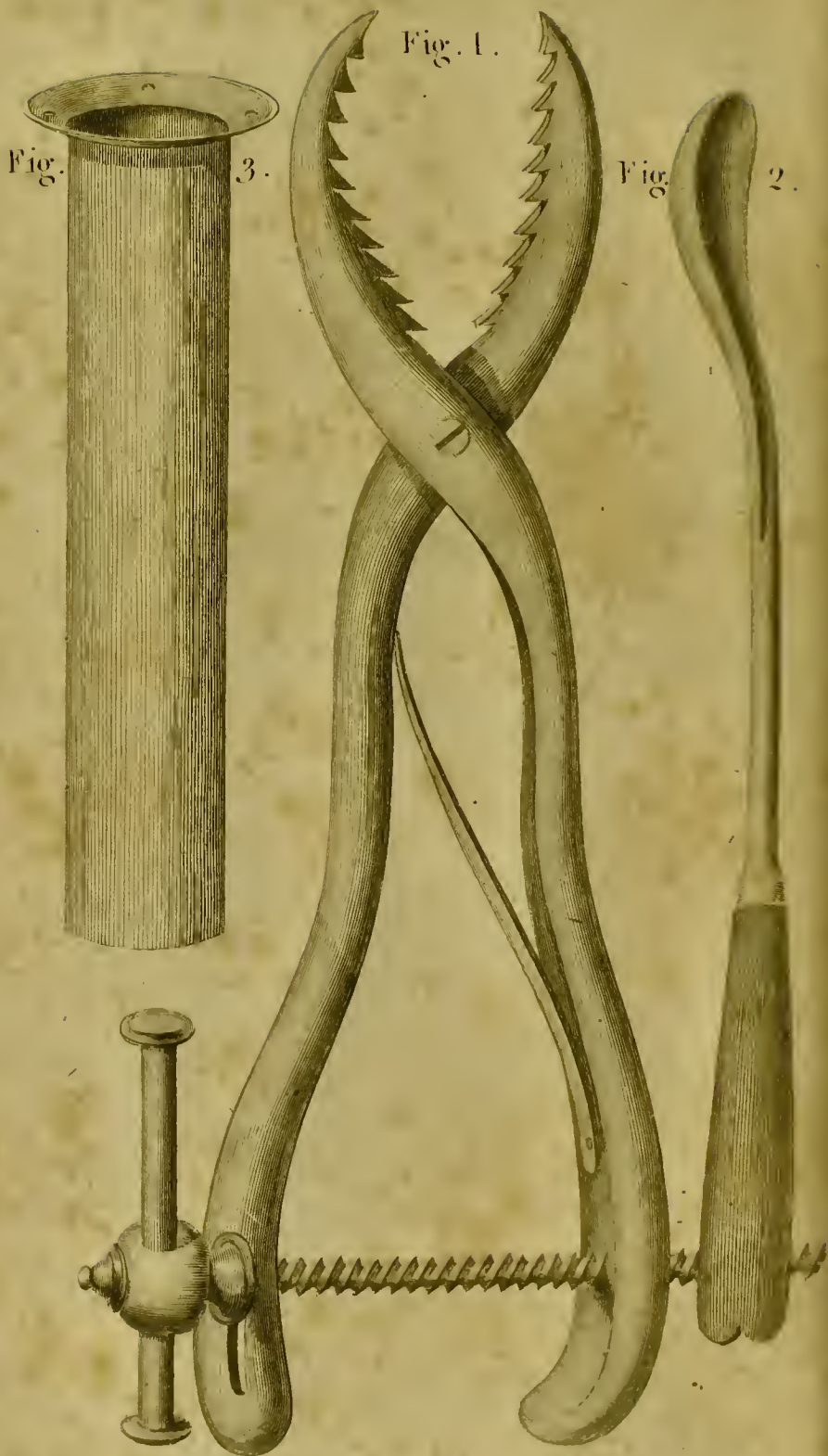
it forms will not only be of a different size, but different parts may be cut by it.

But the most material objection to this instrument is, that it is apt to injure more of the bladder than ought to be cut. The prostate gland only, together with a small portion of the neck of the bladder, should be divided by this knife; but as it is always necessary to insert the point to a considerable depth, before this can be done, the sides and even fundus of the bladder are in this manner very apt to be injured.

The only advantage which this instrument is supposed to possess over the cutting gorget or director is, that being inserted shut, and withdrawn open, only one cut is made in the parts through which it is made to pass; whereas, it is alleged, that in the usual method of employing the gorget or director, one incision is formed by the introduction of the instrument, and another when it is withdrawn. But, by attending to the directions that I have given in Chap. XXIX.

this





this inconvenience commonly attributed to the gorget, and consequently to the director, may be always avoided; and as these instruments form a more free cut than the lithotome cachée, and as they do not so readily injure any part of the bladder which ought not to be cut, they should therefore be preferred.

Fig. 3. Forceps with a screw *H* passing through their handles. When a stone is properly fixed in the forceps, various inventions have been proposed for preserving them in their situation; but the one I have here represented is the best and the most simple of any that has been mentioned.

PLATE LXXVII.

When treating of Lithotomy, in Chap. XXIX. I had occasion to notice the risk attending the extraction of a large stone; and when a stone proves to be so large as to give cause to suspect that it cannot with safety be taken out entire, I have given it

as my opinion, that it should rather be broken into different pieces: For this purpose various instruments have been proposed.—Fig. 1. represents forceps with long teeth, by which almost any stone may be broken.—By the screw and lever connected with it, a much greater force may indeed be employed than will commonly be required:—These forceps should be twelve inches in length, and of a sufficient firmness in every part, particularly in the joint, for bearing any force that may be needed,

Fig. 2. A scoop for extracting such small pieces of stone as cannot be taken out with common forceps.

Fig. 3. A silver canula for inserting into the wound after the operation of lithotomy, for compressing such arteries as lie too deep to be tied with ligatures. This tube should be of a flat form: For a full-grown adult, an inch broad and four inches in length; and before being introduced, it should be covered with several plies of soft old linen. There should be



Fig. 1.

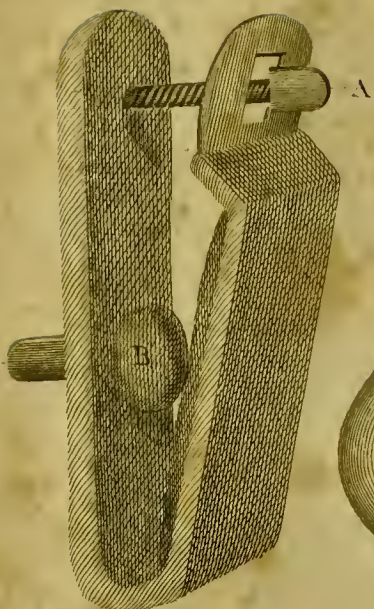


Fig. 2.

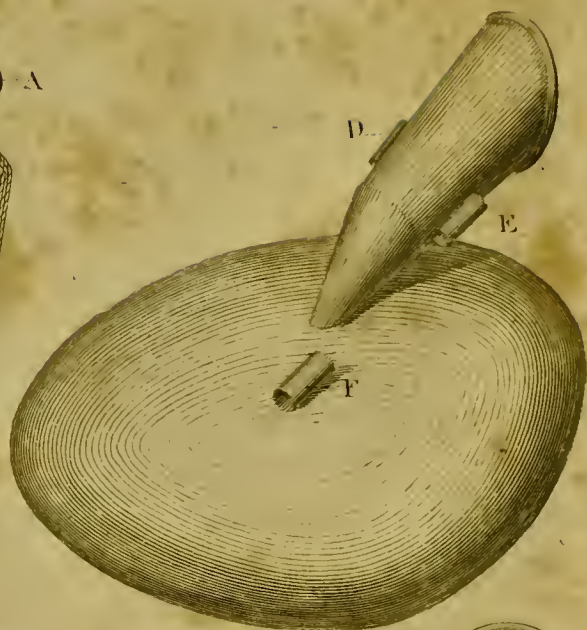


Fig. 3.

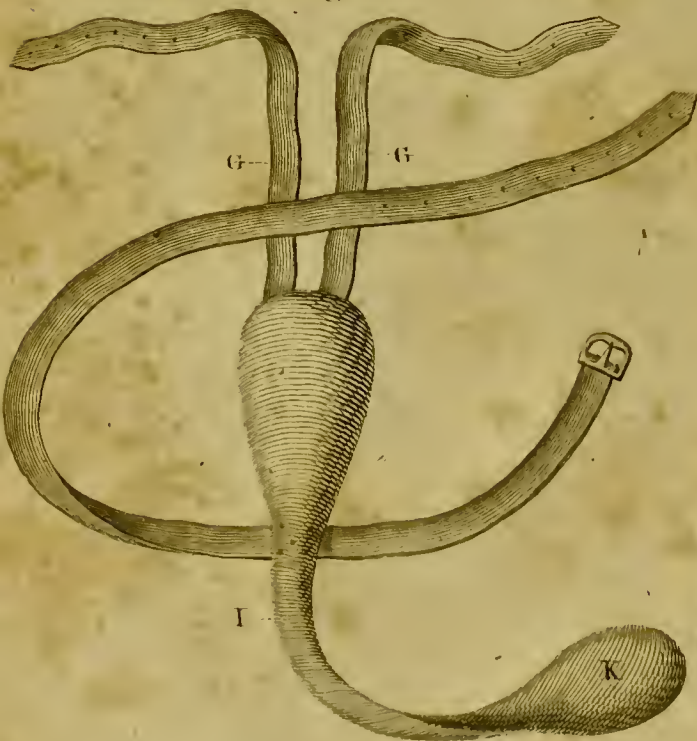
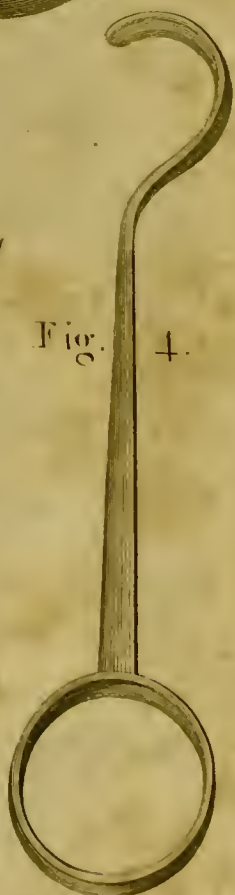


Fig. 4.



two holes in the brim of the instrument for connecting it by means of two pieces of tape to a circular belt round the body.

PLATE LXXVIII.

Fig. 1. A jugum for compressing the penis, and it should be made to fit upon the parts without producing pain or uneasiness. It consists of a piece of elastic steel lined with velvet or soft flannel. By means of the screw *A*, it can be made wide or strait at pleasure; and the cushion *B* being placed upon the urethra, any necessary degree of pressure may be made with it, by turning the screw with which the cushion is connected. By means of this cushion and screw, the pressure is chiefly confined to the urethra; so that the circulation is scarcely interrupted through the rest of the penis.

Fig. 2. A receptacle for the urine. It may be made either of tin, silver, or any other metal. It is somewhat convex on one side, with a concavity on the opposite

site side, fitted to the inside of the patient's thigh. *DE*, Two tubes for fixing two pieces of tape, by which, when the penis is put into the neck of the instrument, it may be tied to a circular bandage round the body; and the tube *F* serves to fix a piece of tape for tying it round the thigh of the patient.

This instrument, when properly fitted, fits easily, and has frequently proved useful to patients who could not retain their urine, and with whom the jugum, for the reasons I have formerly enumerated, could not be employed.

A receptacle of this kind, of a size sufficient to contain three or four gills, may be so adapted to the thigh as to admit of every necessary exercise.

Fig. 3. A bandage, originally invented by Mr Gooch, for retaining the rectum in cases of prolapsus ani. *I*, a plate of elastic steel covered with soft leather, exactly fitted to the parts on which it rests; and the cushion *K* should be stuffed in such a manner as to produce an equal and
easy



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



easy pressure on being applied to the end of the gut after it is replaced. *H*, a strap to be fixed with a buckle on the forepart of the body above the pubes; and *G G*, two straps connected with the upper part of the instrument, which, by passing over the shoulders, and being fixed by small knobs on each side of the buckle, serve to retain it exactly in its place.

Fig. 4. A flat hook, for the purpose of elevating Poupart's ligament in operating for a crural or foemoral hernia.

PLATE LXXIX.

The three first figures of this Plate represent an apparatus delineated by the late very ingenious Mr John Hunter, for the application of caustic to strictures in the urethra.

Fig. 1. A straight silver canula, with a plug at the end of a silver wire projecting beyond the end of it, so as to form a round knob: At the other end of the wire,

wire, is a small port-crayon, in which is represented a piece of caustic.

Fig. 2. A flexible canula for applying caustic to strictures in the bend of the urethra. The wire with the small port-crayon is pushed out beyond its end.

Fig. 3. A piece of silver wire, with the plug at the end, to be introduced into the canula, as in fig. 1.

In using these instruments, fig. 1. or 2. with its projecting knob, is passed into the urethra till it comes in contact with the stricture, in which situation the tube is kept, and the wire being withdrawn, the port-crayon, with caustic fixed in it, is passed through the tube, and kept applied to the stricture as long as may be judged proper, when, on being pulled into the tube, the whole is withdrawn. I have elsewhere, however, endeavoured to shew, that little advantage is to be expected from this instrument, while much harm may be done by it. Where strictures are of the length of a third or fourth part of an inch, as they often are, I conceive

it to be impossible to remove them with caustic, while there is always some risk, with whatever caution it may be managed, of the caustic breaking off and remaining in the urethra; as there also is, of our bringing the caustic into immediate contact with the sound part of the urethra, instead of applying it directly to the stricture itself.

Fig. 4. A straight silver canula, with a stilette, furnished with a sharp trocar-point. Where strictures are not more extensive than the thickness of a sheet of paper or two, but yet too firm to be passed with a bougie or common staff, by passing the canula of this instrument till it comes in contact with the stricture, the stilette may then be easily pushed through it, when the whole being withdrawn, a bougie may be inserted, and the cure completed by a proper and continued use of bougies. By means of the small holes and screw-nail near the handle of the stilette, the length of the pointed part of this instrument is easily graduated, but

I need scarcely observe, that even with this it requires to be used with great caution, and ought not to be employed but by those who are much versant in the treatment of obstructions of the urethra.

PLATE LXXX.

A tube of copper for conveying fumes of cinnabar to ulcers in the throat or nose: *AB*, a box of copper, containing a heater of iron of the same form, and nearly of the same size, but somewhat less that it may be easily put in and taken out: On this piece of iron, when red-hot, the cinnabar is put, and the cover *CD* with the tube *EF* attached to it, being screwed upon the box *AB*, all the fumes must necessarily pass through *F*, by which they may with ease be conveyed to any particular spot.

In operating for the fistula in ano with a probe-pointed bistoury, when the parts to be cut are thick, some difficulty is occasionally

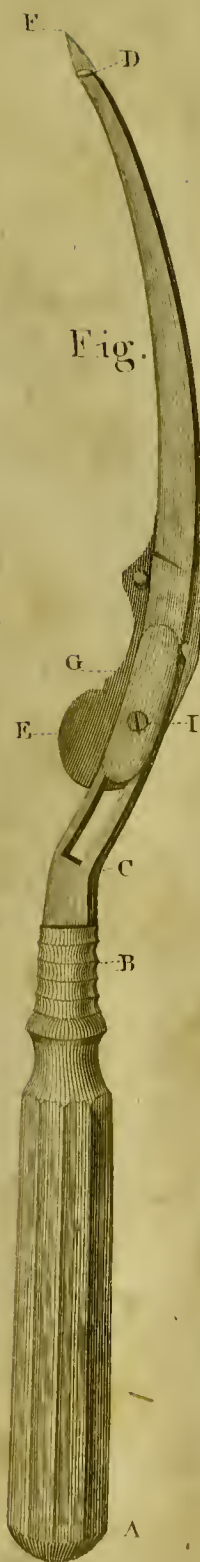
Fig. 2.



Fig. 1.



Fig. 3.





asionally experienced in passing the knob of the instrument through them: This, as I have elsewhere observed, may, with due care and attention, be easily overcome; but some who are not in the frequent practice of this operation, may do it more readily with the instruments, figs. 2. and 3. of this Plate, a very neat invention, for which, I am informed, we are indebted to the ingenious Mr Cruickshank of London.

These figures are in every other respect the same, only the one is straight, and the other crooked; and fig. 2. gives a back view of the instrument; and fig. 3. a front view of it.

This instrument consists of three principal or material parts. The handle *A B*. A probe-pointed bistoury, *C D*, and a sharp-pointed bistoury, *D E*.

The sharp-pointed bistoury is made to slide smoothly upon the other, to which it must apply so closely, that the point *F*, fig. 1. may not be felt as it moves along,
and

and they are attached to each other by a screw-nail at *I*, fig. 3. passing through the slit *C* in the blunt bistoury *CD* into the end of the sharp-pointed bistoury at *E*.

In operating, the fore-finger of the left hand is introduced into the anus. The instrument with the sharp-pointed bistoury drawn back as in fig. 2. is then passed into the sinus till the blunt end of it *D* reaches the top of it, and is felt by the finger in the rectum: An opening is now to be made in the rectum with the sharp-pointed bistoury, which is done by pressing it forward by applying the fore-finger of the right hand to the knob *E*. This being done, and we know that the opening is completed by the finger in the rectum, the sharp-pointed bistoury is again drawn back, when the probe-pointed bistoury *D* being passed into the opening newly made in the rectum, the operation is finished in the usual way as is done with the common bistoury.



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



PLATE LXXXI.

Fig. 1. A splint of timber for a fractured leg, *AA*. Two loops for retaining leather straps, as represented in the front view of the same splint in fig. 2. *CC*. *B*, an opening for receiving the external maleolus, when the leg is placed upon the outside.

Figures 3. 4. 5. and 6. are perhaps the best splints hitherto discovered for fractures of any of the extremities. They may be made of different forms, but one or other of these will answer almost for any purpose: They are made by gluing a piece of thin timber, about the tenth part of an inch in thickness, upon leather. The timber is afterwards cut down to the leather, either with a fine saw or a knife set to a proper depth, in the manner represented in the figures.

These splints are preferable to those made of pasteboard; for while they are longitudinally perfectly firm, they are transversely sufficiently flexible for ply-

ing to the form of the limb. For the method of using them, I must refer to different parts of Sections IX. X. XI. and XII. of Chap. XXXIX.

Splints made in this manner have long been used by individuals; but Mr Gooch was the first who gave any description of them.

PLATE LXXXII.

In this plate I have delineated the instruments recommended by the late Mr Gooch, for preserving a fractured thigh and leg in a state of extension, as is mentioned more particularly in Vol. VII. page 23. and which I shall describe in his own words.

Fig. 1. A machine for extending a fractured leg. The transom to which the sole is secured, is made to be opened and fixed by a pin; and the machine may occasionally be made wider, as appears by other holes in the transom; about which, on each side of the sole, fillets are to be tied,

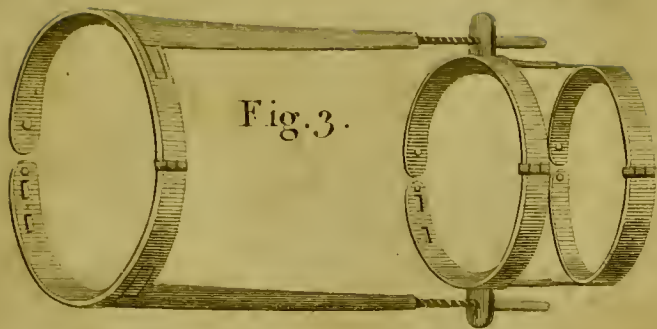


Fig. 4.



Fig. 1.

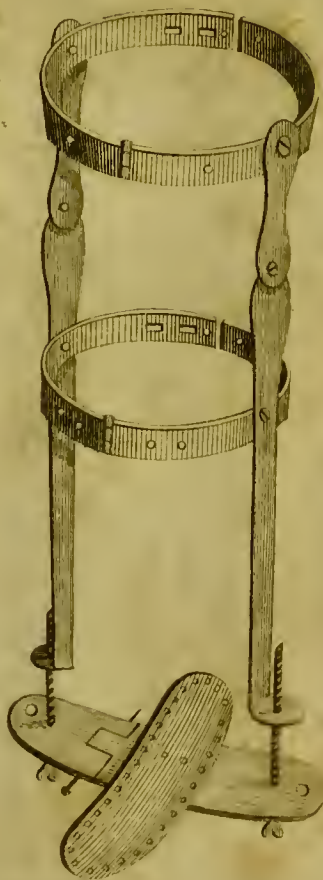
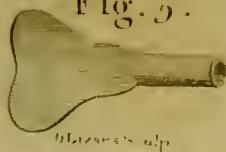


Fig. 2.



Fig. 5.





ried, coming from a demity piece quilted for ease, and laced round the heel and instep, to make the extension upon the working of the screws ; but buff leather may possibly answer better for protecting the parts even than demity.

Fig. 2. Shows the machine, and one of the splints in Plate LXXXI. together upon the limb.

Fig. 3. The longitudinal parts of the machine for the thigh are designed to move upon the circular plates ; by which means it may be accommodated to limbs of different sizes : And as there is a pin at each end of the circular plates, if the limb happens to be larger than ordinary, straps of leather may be added.

Fig. 4. Shows the machine with the ease upon the thigh.

Fig. 5. The key to work the screws. There should be two such keys, that the machine may occasionally be wrought on both sides at the same time.

PLATE LXXXIII.

In Vol. VII. page 23. I observed, that some improvements had been made by the late Dr Aitken upon Mr Gooch's instruments, represented in the preceding plate, for extending fractured limbs: In this plate I have given a representation of these improvements.

Fig. 1. Represents a machine for keeping the fragments of the thigh-bone in situ after setting, whether the fracture is simple or compound, on the neck or body of this bone. *AAA*, the upper circular which applies round the pelvis, like the top-band of a pair of breeches. It rests on the same parts, and is fixed or buttoned in the same manner, by the studs and corresponding holes, *H*.

BB, Two soft-stuffed straps fixed to the back part of this circular, of such lengths as to pass between the thighs from behind forward, to tie round the forepart of the same circular, by means of their forked extremities *CC*. These effectually

Fig. 1.

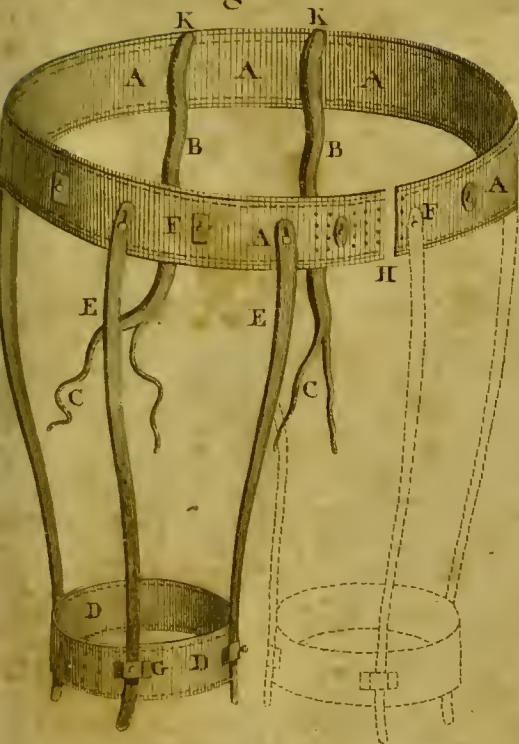


Fig. 2.

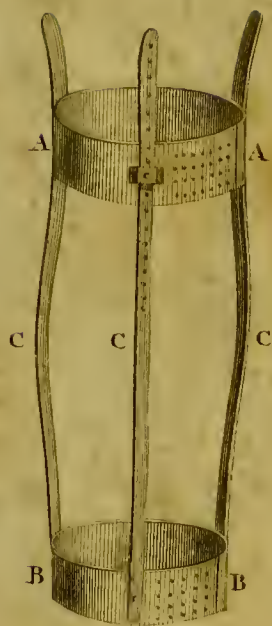
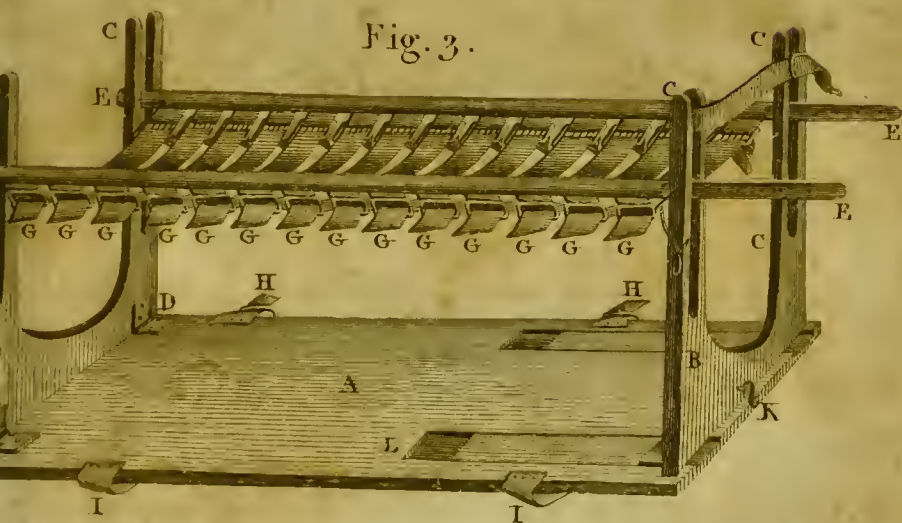


Fig. 3.





fectually secure the circular from moving upward. There are two obscure joints, *K K*, in the back part of this circular, to facilitate its application; but it applies readily enough without them.

D D, The lower circular which fixes above the knee at the gartering place.

E E E, Three graduating steel splints which extend from the one circular to the other: Their upper extremities are fixed to the upper circular by vertible flat-headed studs, similar to those at *FF*: Their lower extremities pass through the iron screw-plates *G*, firmly rivetted to the lower circular. The splints are provided with a number of impressions or holes, in which the screw-nails which pass through the plates are fixed. By pushing the splints from below upward, the distance between the circulars is increased; and by turning the screw-nails, it is maintained: Consequently, that part of the thigh included between the circulars can be kept extended at pleasure. The splints here are fixed for the right thigh; the

pricked lines on the other side, show how they may be accommodated for the left thigh, or for both at the same time.

The larger circular *A A A*, consists of a piece of thick saddle-leather; all except its perforated part, and about a quarter of an inch on each edge, is covered on the inside with a flexible thin iron plate, such as is sometimes used by tin-plate workers: Over this it is lined with the softest buff, or shamoy leather, between which and the plate a thin layer of hair or wool is interposed: The lining ought to project on both sides half an inch or more, to prevent it in any degree from pressing on the skin.

The small circular *D D*, or inferior fixed point, is exactly similar to the large one in structure, the tin-plate excepted: which, on account of its smaller diameter, was found to be unnecessary.

The breadth of the upper circular, when extended for an adult, may be from three to four inches: That of the under circular should be in the same proportion.

The

The graduating steel splints, *E E E*, must be sufficiently long to extend from the upper circular to the lower, and to project over it about a hand-breath: They require to be about four or five eighth-parts of an inch broad, and about one eighth part of an inch thick.

Fig. 2. A machine constructed on the same principle with fig. 1. for the retention of a fractured leg.

AA, a circular, which applies below the knee-joint.

BB, Another, which fixes at the ankles.

CCC, The graduating splints similar to those of the thigh-machine, both in construction and action.

Fig. 3. A fracture-box mentioned in Vol. VII. page 64. as the invention of Mr James Rae, surgeon of this place, improved by Mr John Rae his son.

A, The sole or base, which should be a firm board, an inch and half thick. *BB*, the two ends which support the side beams *CCCC*. *D*, a brass hinge, which, with a corresponding hinge on the other

end of the machine, admit of the ends folding down so as to render it more portable than it otherwise would be. *LL*, Two parallel grooves for receiving two projecting parts of the corresponding end of the machine, by which the same instrument may be extended or shortened so as to fit any length of member. *EEEE*, Two lateral beams, which by the holes in their extremities will serve for any length to which the instrument may be extended: And by a pin at each end passing through the holes in the end beams, any one of the sides, or both of them, may be raised at pleasure.

GGGG, &c. Twelve or fourteen buckles on each side of the machine, with corresponding pieces of girth two inches broad, on which the member is supported by buckling them exactly to the form of the limb. *HI, HI*, Two straps, with corresponding buckles for fixing the base of the machine to the bed. The limb is fixed to the machine by two straps and buckles, one fixed at each end.

The

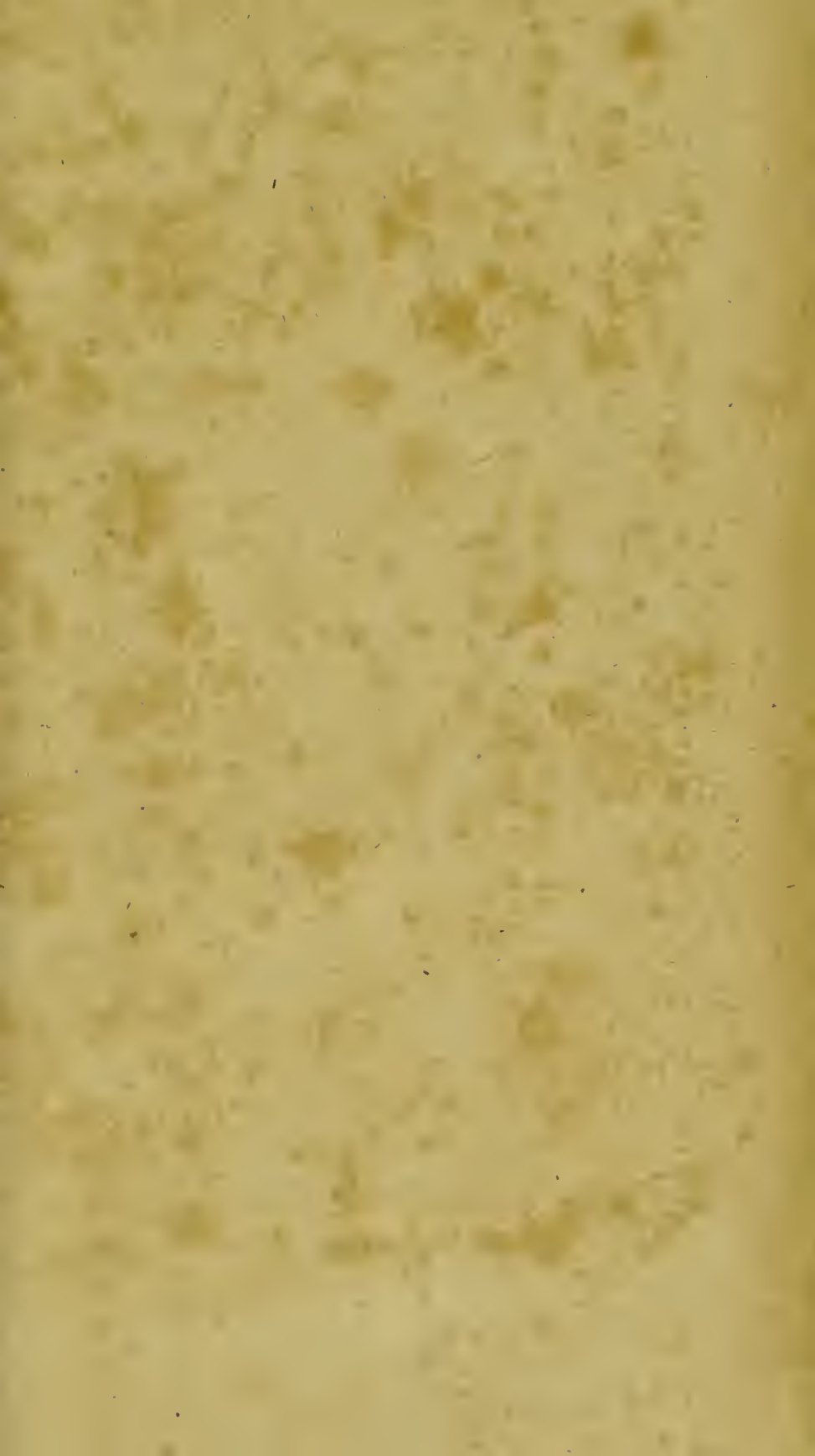


Fig. 1.

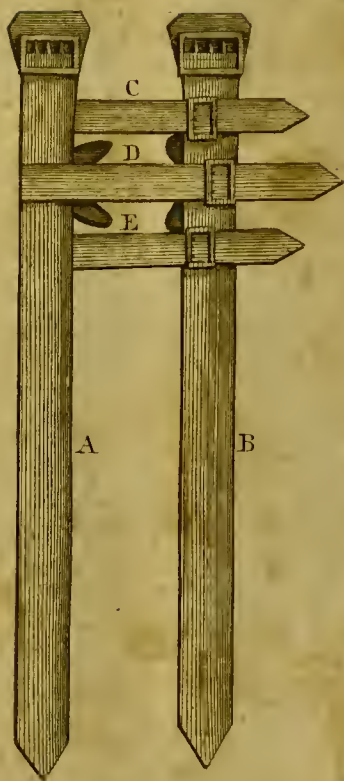
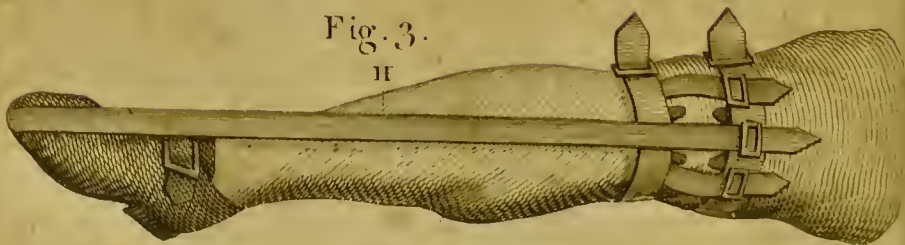


Fig. 2.



Fig. 3.
H



The advantages of this instrument are, that in compound fractures the sores can be inspected and dressed without deranging or moving any part of the limb, merely by removing such of the straps as are opposite to the sores. Instead of a twelve or eighteen-tailed bandage of the common form, separate pieces of flannel should be used; so that such of those as are wet with the discharge can be easily moved without touching the rest.

In this manner sores may be regularly dressed without being moved till a cure is accomplished, while the limb may be raised to any angle, by heightening one or other of the ends of the lateral beams by means of the holes and pins at each end.

PLATE LXXXIV.

Fig. 1. A machine for retaining the different parts of a fractured patella.

A, a strap to be fixed by means of the buckle at one end on the upper part of the leg

leg immediately below the knee. *B*, a similar strap to be fixed above the knee.

Fig. 2. A back view of the same machine. *F*, a semilunar compress of cork covered with shamoy leather, to be placed immediately above the upper part of the patella. *G*, a similar compress for supporting the inferior part of the bone.

These compresses being properly placed may be drawn to any degree of tightness by means of the straps and buckles *CDE*.

Fig. 3. A limb with a fractured patella, and the bandage fig. 1. applied to it. In this figure the strap *H* is added to it: Being fixed to the point of the shoe, and connected with one of the buckles above the knee, the limb is thereby kept extended; by which there is no risk of the fractured parts of the patella being forcibly pulled from each other, as would necessarily happen were the limb to be suddenly bent before the cure should be complete.



Fig. 1.

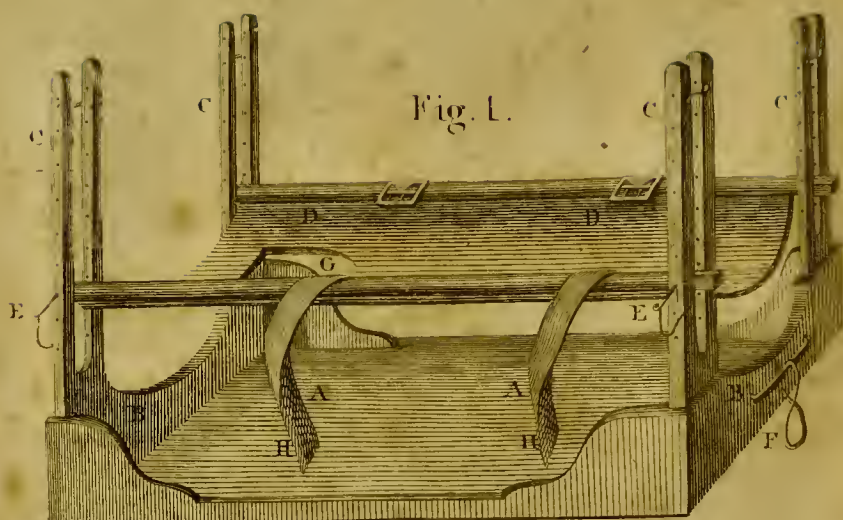


Fig. 2.

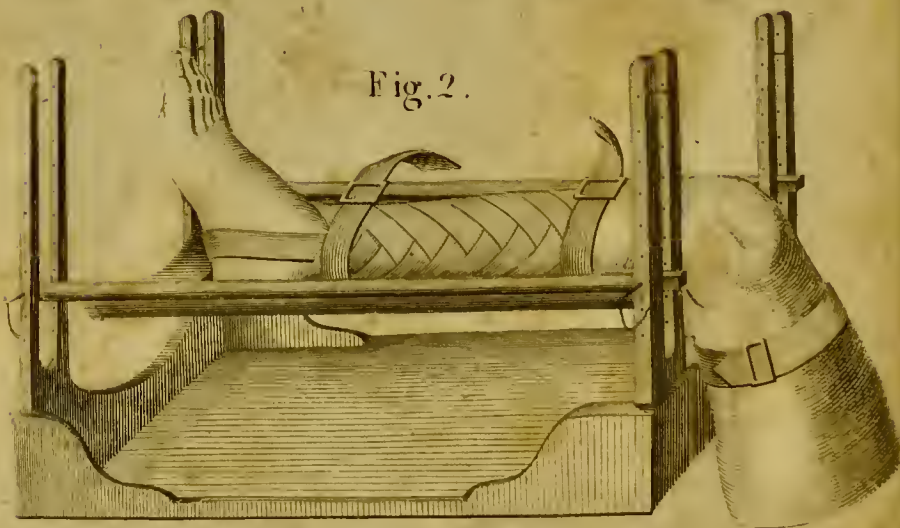




PLATE LXXV.

Fig. 1.



Fig. 2.

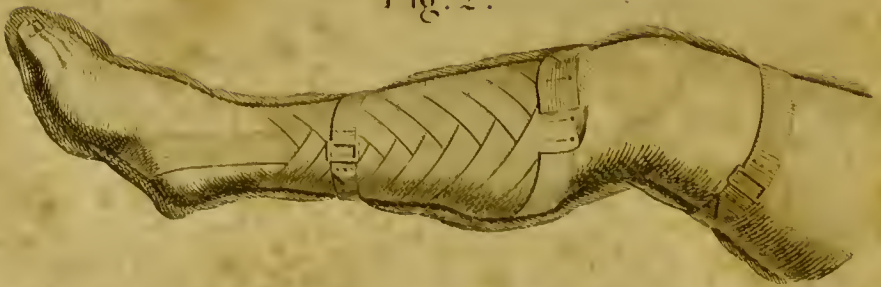


PLATE LXXXV.

Fig. 1. A fractured limb dressed with an eighteen-tailed bandage, and laid upon the outside with the knee bent.

Fig. 2. A fractured limb with an eighteen-tailed bandage, and one of the flexible splints in Plate LXXXI. There is also placed beneath the limb a firm unyielding splint, such as is represented in the same Plate, fig. 2.

PLATE LXXXVI.

I have here delineated a fracture box, mentioned in Vol. VII. page 40.

Fig. 1. *AA*, The base or bottom of the instrument, formed of deal an inch and half thick. *BB*, Two ends rising from the base, and terminating in the pillars *CCCC*. *DD*, An excavated moveable piece of timber for supporting the fractured limb. This moveable part of the instrument may be raised and supported at any height

height by the pins *EE* passing through the holes in the pillars *CCCC*; and it may at pleasure be raised at one end and depressed at the other.

HH, Two straps connected with buckles on the opposite side for fixing the limb after it is properly placed. Before laying down the leg, the dressings should be all applied, and the excavated board should be completely lined with soft wool. *G*, a hole for receiving the heel to prevent it from being hurt when the leg is stretched out in the manner represented in fig. 2.

The ends, *BB*, may either be fixed to the base of the instrument, or, in order to render it more portable, they may be made moveable, and fixed for use by a double pin at each end, *F*.



Fig. 1.

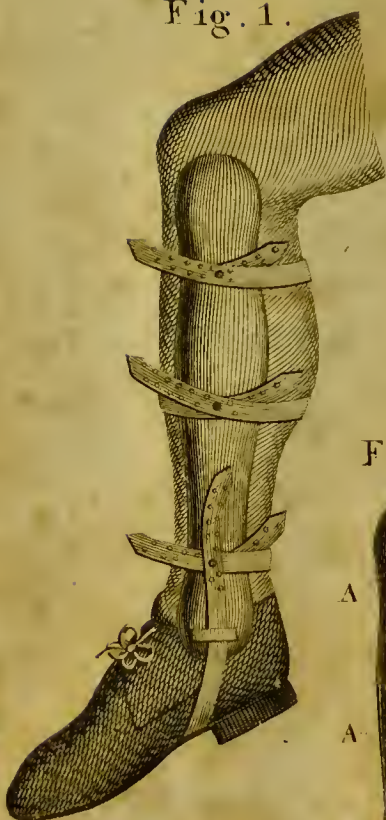


Fig. 2.



Fig. 3.

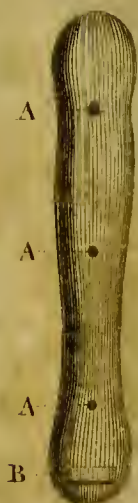


Fig. 4.

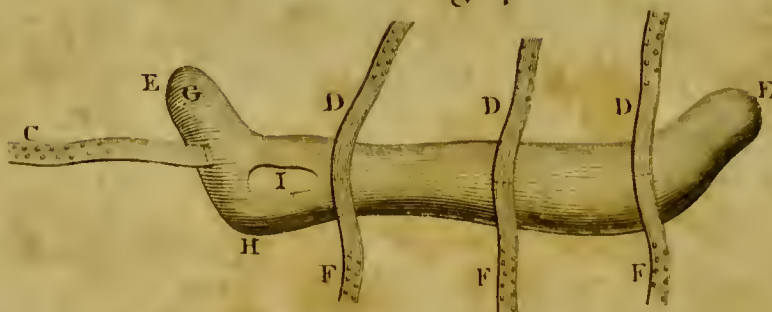


PLATE LXXXVII.

As the splints used by Mr William Sharpe are still preferred by some practitioners, I have given a representation of them in this Plate.

These splints, figures 3. and 4. are formed of strong pasteboard made with glue; they are fixed upon a fractured leg with three straps which surround the whole.

Fig. 4. Represents an under splint of an irregular form, suitable to that part of the leg it is meant to cover: It is a little convex externally, and concave internally. The length for a middle-sized man, eighteen inches from *E* to *E*; the width, two inches and three quarters at the strap near the knee, and two inches and a quarter at both the other straps.

DF, DF, DF, three leather straps from fifteen to twenty inches long, and one inch wide, having two rows of holes so placed,

